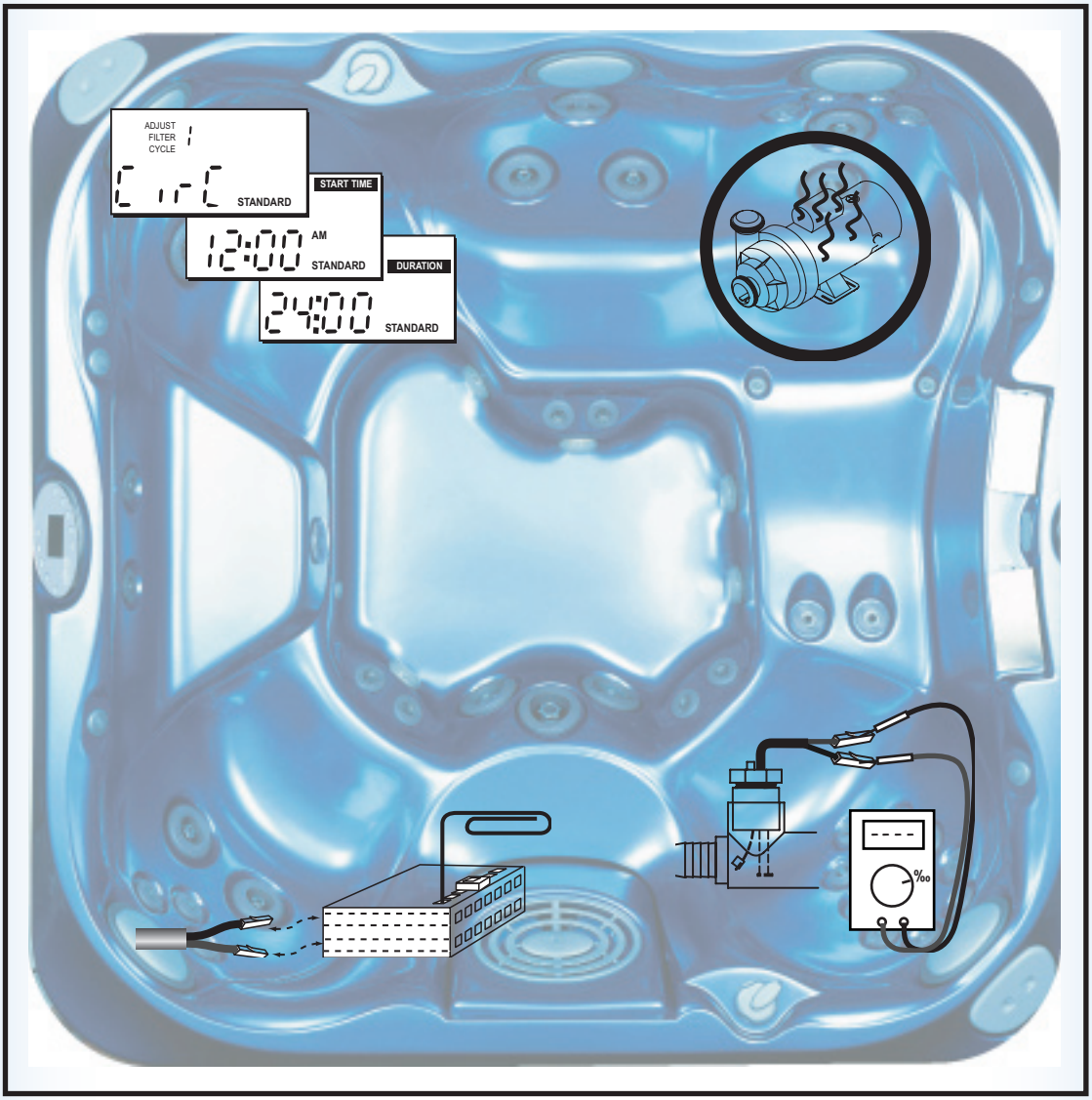
Jacuzzi®

PREMIUM



Standard Troubleshooting Approach

S.T.A. Manual

2003 Jacuzzi Premium

Protech LCD Model Hot Tubs

(J-350, J-360, J-370, J-380)

The following symbol is placed throughout this manual for your protection. Always use extreme caution whenever performing repairs to electrical control system components of any kind!

Danger: Electrical Shock Hazard Exists!
High Voltage Present On Circuit Board. Use Extreme Caution While Servicing Circuit Board.

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1.0 Standard Troubleshooting Approach (S.T.A.)

1.1 Why A Standard Troubleshooting Approach?

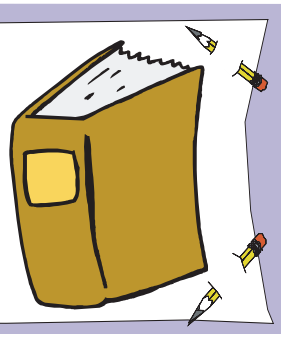
Service prices are basically set by local industry and geographic region. Stiff competition in the service industry has made it difficult to raise the price of a service contract; or charge more for time and materials than the competetive shop down the street. If your business is to be profitable, you must control the overall **cost of service**. The total cost of service is made up of many individual factors, but three in particular are more important than the rest combined:

1. Time of Repair - How long it takes to find and fix a problem.
2. Time Between Failures - How often are you called to repair any one particular hot tub? How many times are you called back to fix the same problem on the same hot tub?
3. Parts Usage - Except in rare circumstances, only one part fails. How many parts do you replace before you find the bad one.

The Jacuzzi Premium STA Manual has been designed to help you control the overall cost of service by focusing on the three important aspects of your job outlined above. The STA will help you fix your customer's hot tub quickly, fix it well, and use fewer parts.

1.2 How To Use The STA

The STA was developed by the Jacuzzi Premium Technical Support Department and is designed to be the communications link between you and your customers. If you call for help on any symptom covered in this book, you will be told to do what the STA recommends, therefore, you will save time by calling technical support after you have done what the STA tells you to do.



1.3 Professional Customer Service

Doing your job in a way that keeps cost of service low and profit margin high also creates customer satisfaction. That's being a professional!

1.4 Responding To An Incoming Service Call

1. <u>Phone personnel.</u>
   - Which staff member(s) takes the initial call? This person is responsible for handling the call, writing up and making sure that the service technician receives all the information the same day.

2. <u>Determine the customer complaint.</u>
   - Determine whether this is a service call or a maintenance issue that can be handled over the phone.
   - Saving you (the technician) time and the company money should be a priority.

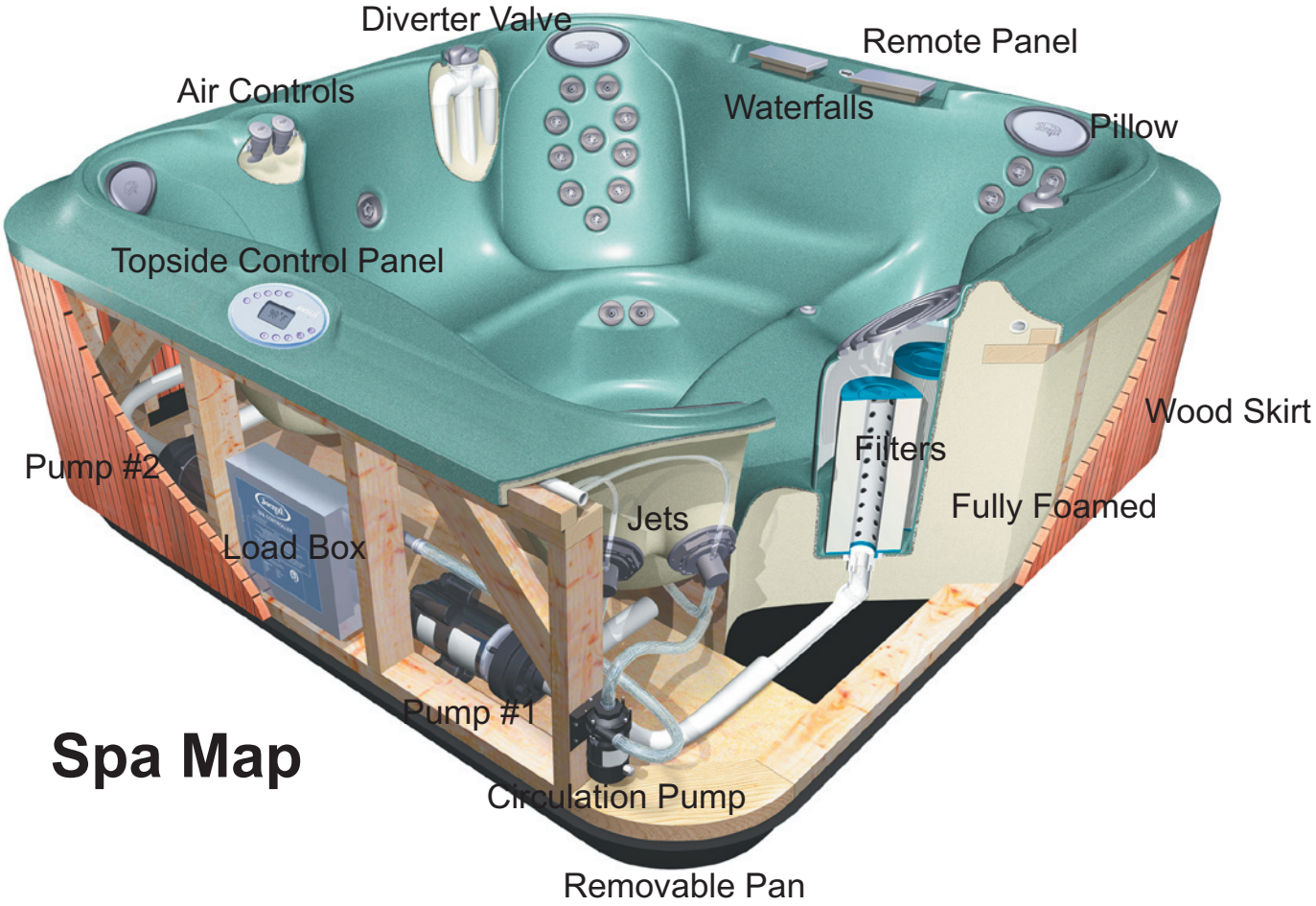
3. <u>Verify the model number, serial number and confirm that this is the original owner of the spa.</u>
   - The original owner is the only one covered under the terms of the warranty.
   - Know what components are covered under the terms of the warranty, the length of time of the warranty and then confirm that the owner understands what will and won't be covered in the event of a service visit.

4. <u>Question the homeowner to determine, if possible, what specific component is not functioning.</u>
   - Use the map of the spa (see below); become familiar with the components and their names. This will also help when speaking to technical service.
   - Keep the Owner's manuals in an accessible place.
   - Know the difference between the spa's components and how they perform when utilized in the spa. Example: An air control will induce air into the plumbing of the jet, increase the flow of water and make the jet more powerful.

5. <u>Ask what is showing on the control panel.</u>
   - Are there any error messages? Ask the customer to specifically describe the topside control panel readout, if any.

6. <u>Determine if the error message is the result of a safety feature or if a service call needs to be set up.</u>
   - "Cool" and/or "Ice" are generally the result of a spa that has just been filled or refilled and doesn't require any action on the part of the homeowner or the technician.
   - Know how the filtration system works, what its defaults are, when it comes on and if there are any automatic times that it will come on during each day. **Know the symptoms!**

7. <u>Setting up the appointment.</u>
   - Make sure you verify the name, address, phone number and where the customer can be reached if not at home.
   - Ask if there is access to the spa if the owner is not going to be present.
   - Ask about anything that may bar your access to the spa such as locked gates, locked electrical boxes, vicious dogs, etc.



Spa Map

8. Make Sure there is access to the main breaker and GFCI, and ask the homeowner to disconnect if possible before you arrive at their home.

9. Use the home service visit as an opportunity to sell aftermarket items such as chemicals, towels, etc.

10. Educate your staff regarding chemicals that are important for optimal use and longevity of the spa components.
    - Chemical misuse is not covered under the terms of the warranty.

11. Know what to recommend when the customer complains that they cannot get their chemicals properly balanced. This is not a service call covered by the warranty or a problem that involves the manufacturer.
    - All spas are used differently: heavy or light bather loads, adults only, the whole family, bromine or chlorine, etc.

12. Does the customer know how to properly clean the filter and that the spa needs to be disabled when doing so?
    - Suggest a second filter to the customer if the original filter needs to be soaked in a cleaning solution. **Have one in your truck!**

13. Find out what chemicals the customer is using. If they have saturated the spa with different kinds of chemicals, sometimes it is best to empty the spa and start all over.

BENEFITS YOU WILL RECOGNIZE

- A satisfied customer is one who will continue to call upon you for business and does not contact your competitors.

- Educating your staff will increase their value and allow you to focus on **real** service issues.

- Being properly prepared will increase your productivity and permit you to enjoy a weekend once in a while.

- Bottom Line: If you change the way you approach your customer, you'll be putting more money in your pocket.

1.5 Preparing For A Service Call

1. Know what each call is asking of you; determine whether or not the extent of service can be handled with a simple phone call or if it requires a visit.
   - Determine whether the call is warranty or non warranty. Make sure the customer is aware that the manufacturer will not cover out-of-warranty service.
   - If you plan to charge the customer for travel expenses, make sure that they are aware of the costs before you show up.

2. Make sure all of your testing devices are functioning properly and extra batteries are on hand.
   - **Always bring a meter; when calling technical support, please ensure that you have all of the pertinent information, such as the spa's serial number, model number, the system you are working on, etc.**

3. Prepare your route so you may complete the maximum number of service calls each day.
   - A map book or a large map of your service area will greatly increase your efficiency.

4. Bring all the tools needed to properly perform service calls.
   - Always have your vehicle properly stocked with replacement parts.
   - Have a sump pump available for draining purposes; emptying a spa from the drain line takes a lot of your time, which we know is extremely valuable.

5. Properly prepare for the day's service calls.
   - When reviewing your calls, think of every possible component and tool that you may need. For example, if there is a heating problem or the heater doesn't come on, think of all the components that include anything to do with a heat call, such as the temperature sensor, circulation pump, main pump, flow or pressure switch, filter, circuit board, heater, etc.
   - Prepare for the worst possible scenario and plan to be able to satisfy the subsequent problems that may arise.

6. Dress appropriately. Although this is one job where shorts are acceptable, to maintain your credibility as a professional, leave the half shirts and shirts with derogatory or obscene comments at home.
   - Finish your cigarette before speaking with the spa owner and remember - **no drugs or alcohol!**

7. Be on time for your appointments. If you are going to be late or can't make the appointment, call the customer to inform them of what's happening.
   - Call your office and ask them to call the people on your schedule to tell them you are running late.

8. Always support the product that you service.
   - **Do not berate the product in front of the homeowner.** It is essential to maintain the integrity and reputation of the product, and berating the product may affect your credibility as an authorized service professional.
   - If you feel there is a problem that needs special attention, call us or complete a quality alert. Remember, this is a partnership between you and the manufacturer - we want to provide the best quality product possible, with your business providing the best service possible!

9. Make professional repairs.
   - Putting bondo, underwater epoxy, silicone or any other product to fix cracked or leaking plumbing will not adequately correct the problem and will most likely result in a return visit. Replace the component or come back and do it for free!
   - Make repairs look as good as or better then when you started.

10. Make sure you leave the customer's home as clean as you found it.
    - Most customers don't mind if you are having lunch in their backyard, as long as you remove the evidence! Make sure to pick up any trash that you may have generated through repairs as well as break times, lunch, etc.

11. Leave a work order with the customer explaining what you found to be the problem and how you corrected it.
    - **Make sure the customer understands the work order.**

12. Suggest to the customer any improvements they can make in maintaining their spa.

13. Recommend replacement filters or a new cover if there is a need for one. A spa vac is an easy sell once you demonstrate it to the customer.

14. Always carry a box of filters and a box of the basic chemicals; once you have finished the service, politely ask if they need any chemicals or a new filter. Drop off chemicals in a sealed box if they have ordered them when they made their service appointment.

1.6 Before Calling Technical Support

Make sure you have followed the STA and filled out a "Troubleshooting Data Collection Form" (see example on page 63). Have the STA manual and the Troubleshooting Data Worksheet near the telephone. Technical Support can help you best if these things become the communications tools for the phone call.

1.7 Before Leaving The Customer

Even if you don't have to fill out a Troubleshooting Data Collection Form, please do so. If this is a warranty repair, the information will be needed when your office fills out the "Returned Goods/Labor Tag". In any case, it will help you spot trouble before it happens. Pumps burn up if voltage at the hot tub is too low. Circuit breakers trip if heaters and motors draw too much current (Amps). Wires overheat and connections burn if wire size is too small or push-on connectors are loose. *Call backs cause cost of service to increase!*

1.8 The Trouble Log

Intermittent problems, frequent circuit board and pump replacement, and vague complaints of "sometimes" unsatisfactory hot tub performance, are all major headaches for the owner, technician and Jacuzzi Premium. Temporary conditions like temperature extremes, low line voltage, and line voltage fluctuations are often the culprits. But how can you prove such events happened unless a technician sits around the hot tub for days with thermometers, voltmeters and log books? With the Trouble Log, that's how! The Trouble Log is an automatically updating memory built into the control system. If the Trouble Log is reset at the end of a service call, it will monitor and record:

1. Highest, present and lowest line voltages as a percentage of 240 VAC.
2. Highest, present and lowest temperature sensed by the hi-limit sensor.
3. Highest, present and lowest temperature of the circuit board in the load box (9.50A Eprom only).

(3) (Highest, present and lowest temperature sensed by the temperature sensor (9.50B Eprom only)).

4. Displays selected line voltage frequency in Hz (cycles-per-second).
5. Ph Adjustment Factor (feature discontinued).

This information helps you diagnose the cause of the customer complaints rather than guess at them. It can help you control callback costs, and increase customer satisfaction by controlled problem resolution rather than the *try-something-and-hope* technique.

This data will help Jacuzzi Premium improve product quality by observing the relationship between environmental conditions and designing equipment that can withstand whatever mother nature and the supply voltage can throw at it.

The data from the Trouble Log can only help if it is:

1. Read on each service call,
2. Recorded accurately on each warranty claim form,
3. Reset to present values at the end of the service call by displaying each record and pressing the COOLER button while displayed.

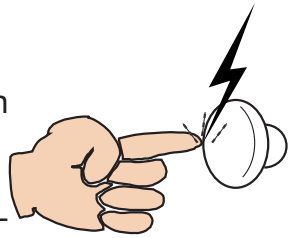
1.9 Satisfying The Customer

Most customers do not care what work you have done or what parts you have replaced, but they always care whether or not their problem goes away. When you are done, show them that their problem is gone. If they ask how you did it, take a few minutes to explain. Show them the bad part(s) and explain or show why it is bad.

- **Develop** the habit of examining the hot tub's you service. Compliment customers on the things they are doing right. Tell them how their care and attention can stop trouble before it starts.
- **Mention** if you noticed any adverse conditions, especially if the hot tub is under warranty or contract, that could lead to failure. Can the customer correct the problem? Would they like you to correct it? Can you recommend someone? Would they like an estimate?
- **Think** of yourself and the customer as a "team" trying to keep the product up and running as cost-effective and time-efficient as possible. That's good for the customer, and it's good for your business.

2.0 Electro Static Discharge

2.1 ESD - What Is It? What Does It Do?

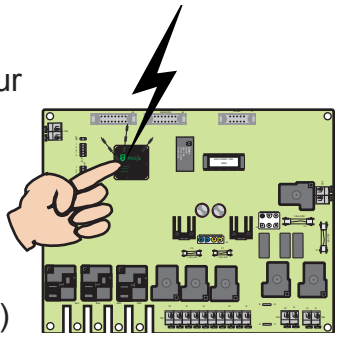


Static electricity is always being generated around us, even at those times when we no longer get zapped after walking across a rug and touching something.

Like all state-of-the-art circuit boards, the hot tub's circuit board can be damaged by unnoticed static electricity. Damaged is the key word. Sometimes a board which has been subjected to ESD will fail immediately upon being put back into service. Usually a board will operate for a few days, or months, then fail.

- **If the hot tub runs only a few days,** the customer thinks you provided poor service.
- **If the hot tub runs only a few months,** the customer thinks the circuit board was a low quality product.
- **The customer loses** use of the hot tub. **You lose money** because you must go back to make it right. Jacuzzi Premium loses its reputation for quality.

2.2 Avoiding ESD Damage



We can't prevent static charges from building up within us as we go about our jobs, so we must do three things to protect circuit boards from getting zapped:

1. Never transport or ship circuit boards - **good boards or bad boards -** except in the static protective bags.
2. Never remove the board from the static protective bag unless you are ready to install it in the hot tub.
3. After removing the bad board from the hot tub, A) lay it on the ground, B) remove the replacement board from the static protective bag, C) lay the replacement board on the ground, D) place the bad board in the bag from which you removed the replacement board, E) return bad board(s) to Jacuzzi Premium in undamaged sealed static protective bags.

2.3 What About Wrist Straps And Special Mats?

The purpose of these devices is to keep the technician, the work surface and the circuit board at the same electrical potential, and drain into ground any static charges which might build up. Proper use of the wrist strap and special mat guarantees maximum protection against ESD damage.

2.4 Must Wrist Straps And Mats Be Used When Replacing A Circuit Board?

No, if you keep the spare board in the protective bag during transport and you observe a few simple techniques during replacement.

The possibility of ESD damage to the circuit board during replacement will be minimal because of the hot tub's design and the way you normally work on it. Touching the ground lug will drain all built-up static charges from your body much like a wrist strap would. Laying the bad board on the ground will tend to keep it neutral. Touching a finger to the grounding lug immediately before removing the good board from the bag will drain charges built up by the rustling of your clothes. Laying the good board on the ground after removing it from the bag will tend to keep it neutral. Another quick touch of the grounding lug before picking up the bad board will drain built up charges. Slipping the bad board into the protective bag will allow it to be transported safely. Another quick touch of the grounding lug before picking up the good board will again drain any charges built up. In the process of installing the replacement board, you and the board will be grounded to the load box or grounding lug, draining off charges you may build up during installation.

3.0 Main System Specifications J-380

Dimensions	*94" x 94" x 38" (239cm x 239cm x 97cm)*
Dry Weight	*1,042lbs (473kg)*
Filled Weight	*5,607lbs (2,543kg)*
Water Capacity (Avg. Fill)	*550 US gallons (2,082 Liters)*
Electronic Controls	*Solid State, LCD User Interface Displays Temperature, Time, Cycles and Fingertip Jet Control. Offers Customizing of Preprogrammed Filtration Cycles and Water Temperature Setting. Also Includes 1 Remote Control Panel for Secondary Jet Control.*
Pump 1	*2-Speed, 4.2hp Brake, 2.5hp Continuous*
Pump 2	*1-Speed, 4.2hp Brake, 2.5hp Continuous*
Pump 3	*1-Speed, 3.5hp Brake, 2.0hp Continuous*
Circulation Pump	*Programmable for Daily Start Time and Duration*
Total PowerPro Jets	*43*
Maxx PowerPro	*7*
PowerPro	*7*
Mini PowerPro	*27*
Micro PowerPro	*2*
Jet Selectors	*2*
Air Controls	*Five, On/Off Push Button Type*
Total Foot Jet Therapy	*3*
Water Management System	*Two 60 ft^2 Filter Cartridges; Filter 1 on 24-Hour Circulation Pump; Filter 2 on 2-Speed Pump 1; Ready for Optional CD Ozone Generator (Built-in Ozone Dispersion Chamber Included in Spa)*
Lighting	*One Underwater LED ProLite with 7 Color Modes + Colored Waterfalls*
Cabinet	*Redwood/Cedar with Coastal, Sierra or No Stain; Optional UV Resistant Synthetic Plastic Cabinet with Embossed Red or Gray Wood Grain*
Acrylic Colors	*Textured Bluegrass, Jade, Marine, Onyx, Sahara or Sand; Marbled Emerald, Platinum or Sapphire; Solid Azure or Silver*
Headrests	*5*
Waterfalls	*Two with Independent Flow Rate / On-Off Adjustment; Powered by Pump 1*
Electrical Requirements	*North American 60Hz Models: 240VAC @ 40, 50 or 60Amp Export 50Hz Models: 230-240VAC @ 35 or 40Amp, suitably rated circuit breaker to comply with local electrical codes. Certain countries may require dual power inputs; two breakers are required for this configuration.*
Warranty	*North American 60Hz Models: 10 Years Shell, 7 Years Shell Surface, 5 Years Plumbing Component Leaks, 5 Years Equipment and Controls. Export 50Hz Models: 2 Years Plumbing Component Leaks, 2 Years Equipment and Controls.*
Seating Capacity	*6-7*
Audio System (Optional)	*AM/FM/CD Stereo Receiver with Dual Pop-Up Speakers*

Dimensions/Specifications are Subject to Change Without Notice.

Jet Selector / Air Control Operation Diagram

Jet Selector 2:
Directs Jet Pump 2 Output Between Jet Groups C or D.

Air Control 1:
Opens / Closes Air Inlet to Jet Group D.

Air Control 2:
Opens / Closes Air Inlet to Jet Group B.

Air Control 5:
Opens / Closes Air Inlet to Jet Group C.

Air Control 4:
Opens / Closes Air Inlet to Jet Group E.

Air Control 3:
Opens / Closes Air Inlet to Jet Group A.

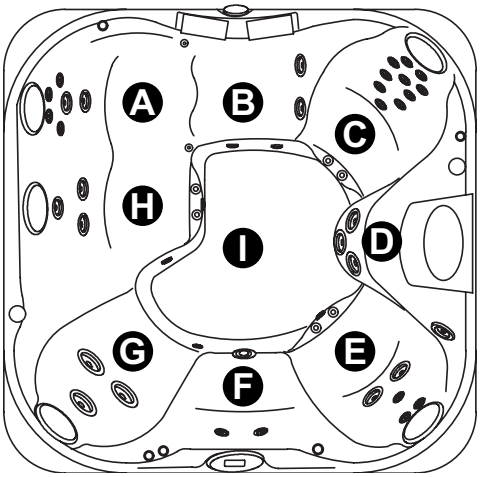
Jet Selector 1:
Directs Jet Pump 1 Output Between Jet Groups A or B.

Foot And Side Wall Jets E Powered by Jet Pump 3

Seat Depths

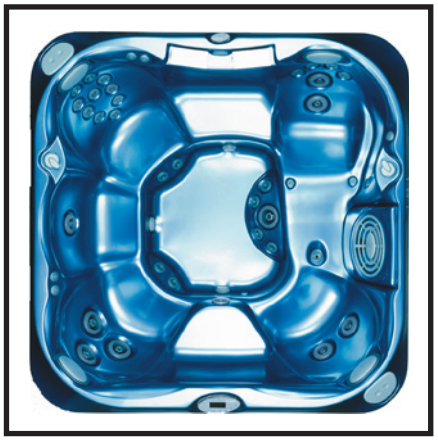
A = 27.00" (68.6cm)
B = 23.00" (58.4cm)
C = 28.50" (72.4cm)
D = 22.75" (57.8cm)
E = 26.50" (67.3cm)
F = 17.50" (44.5cm)
G = 27.50" (69.9cm)
H = 27.00" (68.6cm)
I = 33.50" (85.1cm)

Listed Dimensions Represent Distance from Top of Acrylic to Lowest Point in Seat.



Dimensions/Specifications are Subject to Change Without Notice.

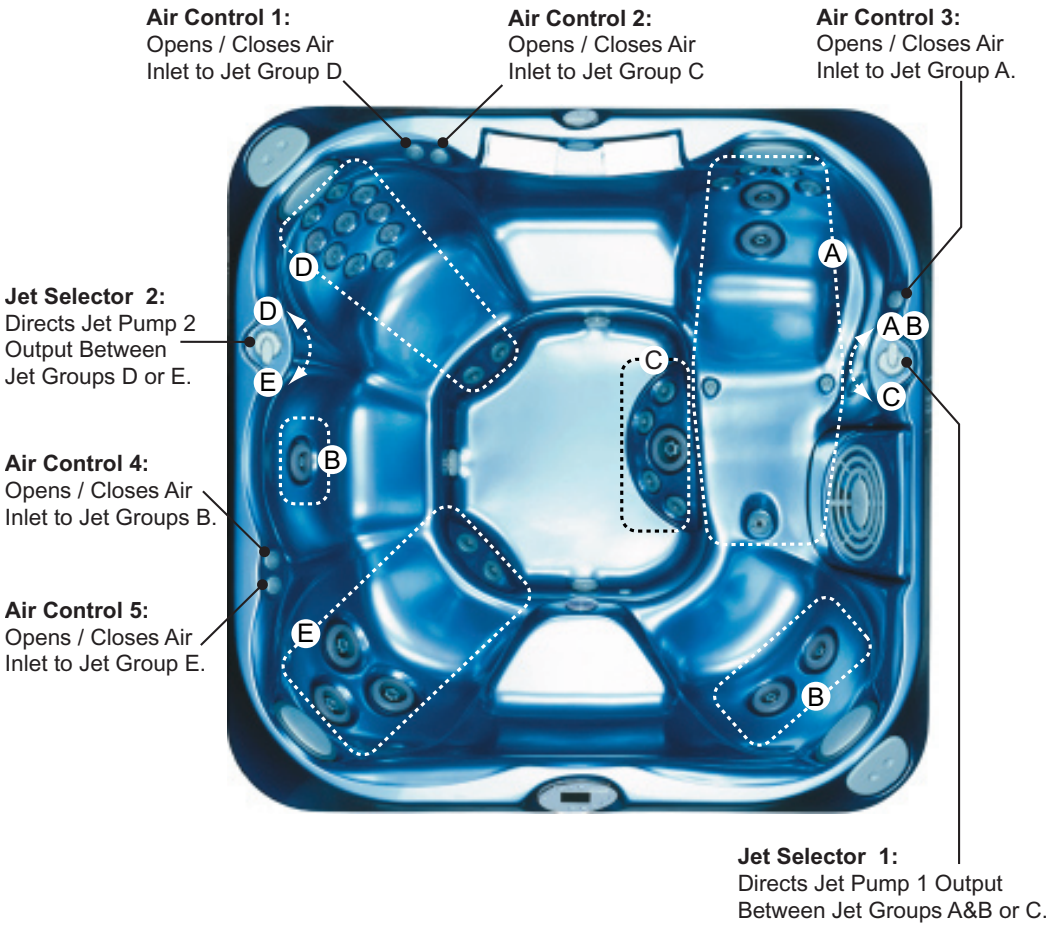
3.1 Main System Specifications J-370



Dimensions	*91" x 91" x 38" (231cm x 231cm x 97cm)*
Dry Weight	*960lbs (436kg)*
Filled Weight	*4,936lbs (2,239kg)*
Water Capacity (Avg. Fill)	*479 US gallons (1,813 Liters)*
Electronic Controls	*Solid State, LCD User Interface Displays Temperature, Time, Cycles and Fingertip Jet Control. Offers Customizing of Preprogrammed Filtration Cycles and Water Temperature Setting. Also Includes 1 Remote Control Panel for Secondary Jet Control.*
Pump 1	*2-Speed, 4.2hp Brake, 2.5hp Continuous*
Pump 2	*1-Speed, 4.2hp Brake, 2.5hp Continuous*
Pump 3	*N/A*
Circulation Pump	*Programmable for Daily Start Time and Duration*
Total PowerPro Jets	*34*
Maxx PowerPro	*4*
PowerPro	*5*
Mini PowerPro	*23*
Micro PowerPro	*2*
Jet Selectors	*2*
Air Controls	*Five, On/Off Push Button Type*
Total Foot Jet Therapy	*5*
Water Management System	*Two 60 ft^2 Filter Cartridges; Filter 1 on 24-Hour Circulation Pump; Filter 2 on 2-Speed Pump 1; Ready for Optional CD Ozone Generator (Built-in Ozone Dispersion Chamber Included in Spa)*
Lighting	*One Underwater LED ProLite with 7 Color Modes + Colored Waterfalls*
Cabinet	*Redwood/Cedar with Coastal, Sierra or No Stain; Optional UV Resistant Synthetic Plastic Cabinet with Embossed Red or Gray Wood Grain*
Acrylic Colors	*Textured Bluegrass, Jade, Marine, Onyx, Sahara or Sand; Marbled Emerald, Platinum or Sapphire; Solid Azure or Silver*
Headrests	*4*
Waterfalls	*Two with Independent Flow Rate / On-Off Adjustment; Powered by Pump 1*
Electrical Requirements	*North American 60Hz Models: 240VAC @ 30, 50 or 60Amp Export 50Hz Models: 230-240VAC @ 35 or 40Amp, suitably rated circuit breaker to comply with local electrical codes. Certain countries may require dual power inputs; two breakers are required for this configuration.*
Warranty	*North American 60Hz Models: 10 Years Shell, 7 Years Shell Surface, 5 Years Plumbing Component Leaks, 5 Years Equipment and Controls. Export 50Hz Models: 2 Years Plumbing Component Leaks, 2 Years Equipment and Controls.*
Seating Capacity	*6-7*
Audio System (Optional)	*AM/FM/CD Stereo Receiver with Dual Pop-Up Speakers*

Dimensions/Specifications are Subject to Change Without Notice.

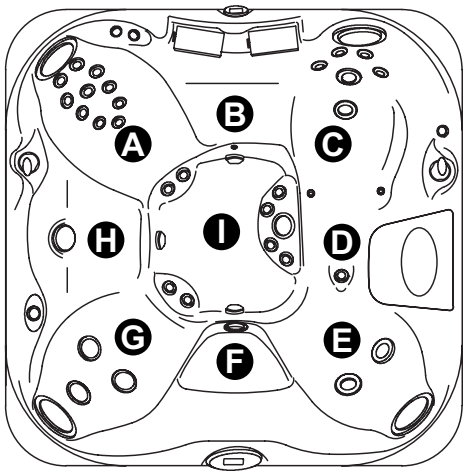
Jet Selector / Air Control Operation Diagram



Seat Depths

A = 28.75” (73.0cm)
B = 21.50” (54.6cm)
C = 26.75” (67.9cm)
D = 22.50” (57.2cm)
E = 26.00” (66.0cm)
F = 19.00” (48.3cm)
G = 27.00” (68.6cm)
H = 26.50” (67.3cm)
I = 34.00” (86.4cm)

Listed Dimensions Represent Distance from Top of Acrylic to Lowest Point in Seat.



Dimensions/Specifications are Subject to Change Without Notice.

3.2 Main System Specifications J-360

Dimensions	91” x 84” x 38” (231cm x 213cm x 97cm)
Dry Weight	882lbs (400kg)
Filled Weight	3,895lbs (1,767kg)
Water Capacity (Avg. Fill)	363 US gallons (1,374 Liters)
Electronic Controls	Solid State, LCD User Interface Displays Temperature, Time, Cycles and Fingertip Jet Control. Offers Customizing of Preprogrammed Filtration Cycles and Water Temperature Setting. Also Includes 1 Remote Control Panel for Secondary Jet Control.
Pump 1	2-Speed, 4.2hp Brake, 2.5hp Continuous
Pump 2	1-Speed, 4.2hp Brake, 2.5hp Continuous
Pump 3	N/A
Circulation Pump	Programmable for Daily Start Time and Duration
Total PowerPro Jets	32
Maxx PowerPro	6
PowerPro	3
Mini PowerPro	21
Micro PowerPro	2
Jet Selectors	2
Air Controls	Four, On/Off Push Button Type
Total Foot Jet Therapy	6
Water Management System	Two 60 ft^2 Filter Cartridges; Filter 1 on 24-Hour Circulation Pump; Filter 2 on 2-Speed Pump 1; Ready for Optional CD Ozone Generator (Built-in Ozone Dispersion Chamber Included in Spa)
Lighting	One Underwater LED ProLite with 7 Color Modes + Colored Waterfalls
Cabinet	Redwood/Cedar with Coastal, Sierra or No Stain; Optional UV Resistant Synthetic Plastic Cabinet with Embossed Red or Gray Wood Grain
Acrylic Colors	Textured Bluegrass, Jade, Marine, Onyx, Sahara or Sand; Marbled Emerald, Platinum or Sapphire; Solid Azure or Silver
Headrests	3
Waterfalls	One with Independent Flow Rate / On-Off Adjustment; Powered by Pump 1
Electrical Requirements	North American 60Hz Models: 240VAC @ 30, 50 or 60Amp Export 50Hz Models: 230-240VAC @ 35 or 40Amp, suitably rated circuit breaker to comply with local electrical codes. Certain countries may require dual power inputs; two breakers are required for this configuration.
Warranty	North American 60Hz Models: 10 Years Shell, 7 Years Shell Surface, 5 Years Plumbing Component Leaks, 5 Years Equipment and Controls. Export 50Hz Models: 2 Years Plumbing Component Leaks, 2 Years Equipment and Controls.
Seating Capacity	6
Audio System (Optional)	AM/FM/CD Stereo Receiver with Dual Pop-Up Speakers

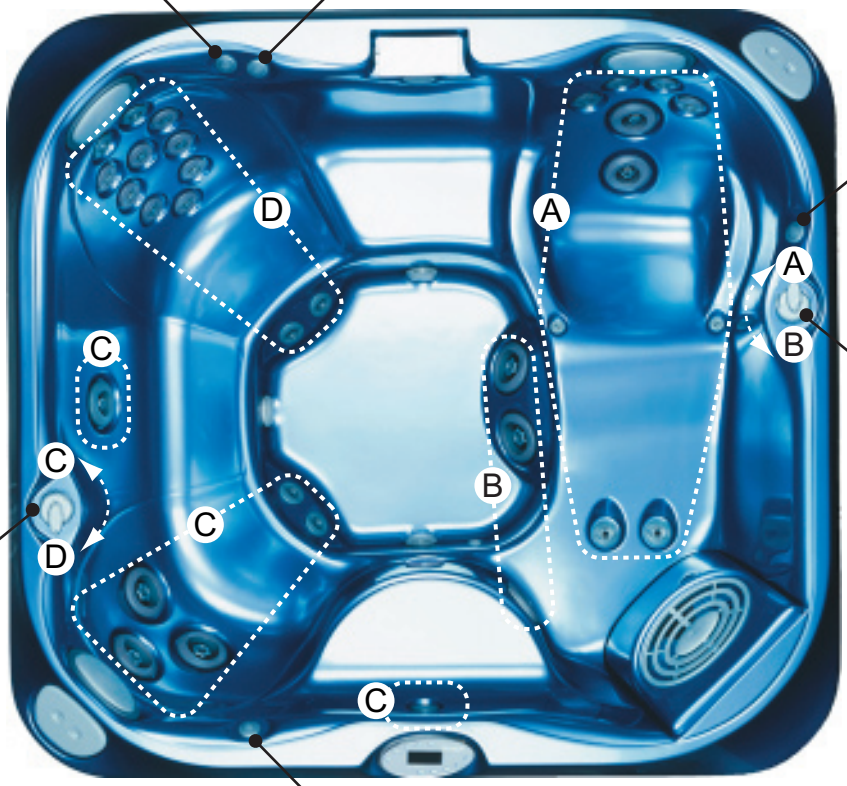
Dimensions/Specifications are Subject to Change Without Notice.

Jet Selector / Air Control Operation Diagram

Air Control 1:
Opens / Closes
Air Inlet to Jet
Group D

Air Control 2:
Opens / Closes
Air Inlet to Jet
Group B

Air Control 3:
Opens / Closes
Air Inlet to Jet
Group A



Jet Selector 2:
Directs Jet Pump 2
Output Between
Jet Groups C or D.

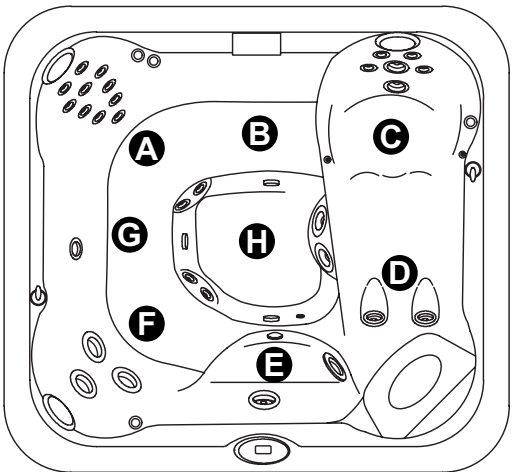
Air Control 4:
Opens / Closes
Air Inlet to Jet
Group C

Jet Selector 1:
Directs Jet Pump 1
Output Between Jet
Groups A or B.

Seat Depths

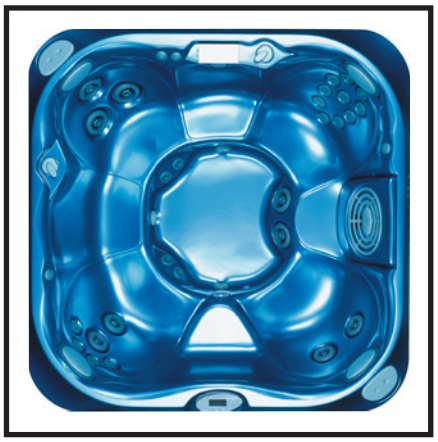
A = 29.00" (73.6cm)
B = 21.75" (55.2cm)
C = 27.00" (68.6cm)
D = 22.75" (57.8cm)
E = 13.75" (34.9cm)
F = 27.50" (69.9cm)
G = 26.50" (67.3cm)
H = 33.25" (84.5cm)

Listed Dimensions Represent Distance from Top of Acrylic to Lowest Point in Seat.



Dimensions/Specifications are Subject to Change Without Notice.

3.3 Main System Specifications J-350



Dimensions	84” x 84” x 36” (213cm x 213cm x 91cm)
Dry Weight	822lbs (373kg)
Filled Weight	3,611lbs (1,638kg)
Water Capacity (Avg. Fill)	336 US gallons (1,272 Liters)
Electronic Controls	Solid State, LCD User Interface Displays Temperature, Time, Cycles and Fingertip Jet Control. Offers Customizing of Preprogrammed Filtration Cycles and Water Temperature Setting. Also Includes 1 Remote Control Panel for Secondary Jet Control.
Pump 1	2-Speed, 4.2hp Brake, 2.5hp Continuous
Pump 2	1-Speed, 4.2hp Brake, 2.5hp Continuous
Pump 3	N/A
Circulation Pump	Programmable for Daily Start Time and Duration
Total PowerPro Jets	27
Maxx PowerPro	5
PowerPro	4
Mini PowerPro	18
Micro PowerPro	N/A
Jet Selectors	2
Air Controls	Four, On/Off Push Button Type
Total Foot Jet Therapy	2
Water Management System	Two 60 ft^2 Filter Cartridges; Filter 1 on 24-Hour Circulation Pump; Filter 2 on 2-Speed Pump 1; Ready for Optional CD Ozone Generator (Built-in Ozone Dispersion Chamber Included in Spa)
Lighting	One Underwater LED ProLite with 7 Color Modes + Colored Waterfalls
Cabinet	Redwood/Cedar with Coastal, Sierra or No Stain; Optional UV Resistant Synthetic Plastic Cabinet with Embossed Red or Gray Wood Grain
Acrylic Colors	Textured Bluegrass, Jade, Marine, Onyx, Sahara or Sand; Marbled Emerald, Platinum or Sapphire; Solid Azure or Silver
Headrests	4
Waterfalls	One with Independent Flow Rate / On-Off Adjustment; Powered by Pump 1
Electrical Requirements	North American 60Hz Models: 240VAC @ 30, 50 or 60Amp Export 50Hz Models: 230-240VAC @ 35 or 40Amp, suitably rated circuit breaker to comply with local electrical codes. Certain countries may require dual power inputs; two breakers are required for this configuration.
Warranty	North American 60Hz Models: 10 Years Shell, 7 Years Shell Surface, 5 Years Plumbing Component Leaks, 5 Years Equipment and Controls. Export 50Hz Models: 2 Years Plumbing Component Leaks, 2 Years Equipment and Controls.
Seating Capacity	4-5
Audio System (Optional)	AM/FM/CD Stereo Receiver with Dual Pop-Up Speakers

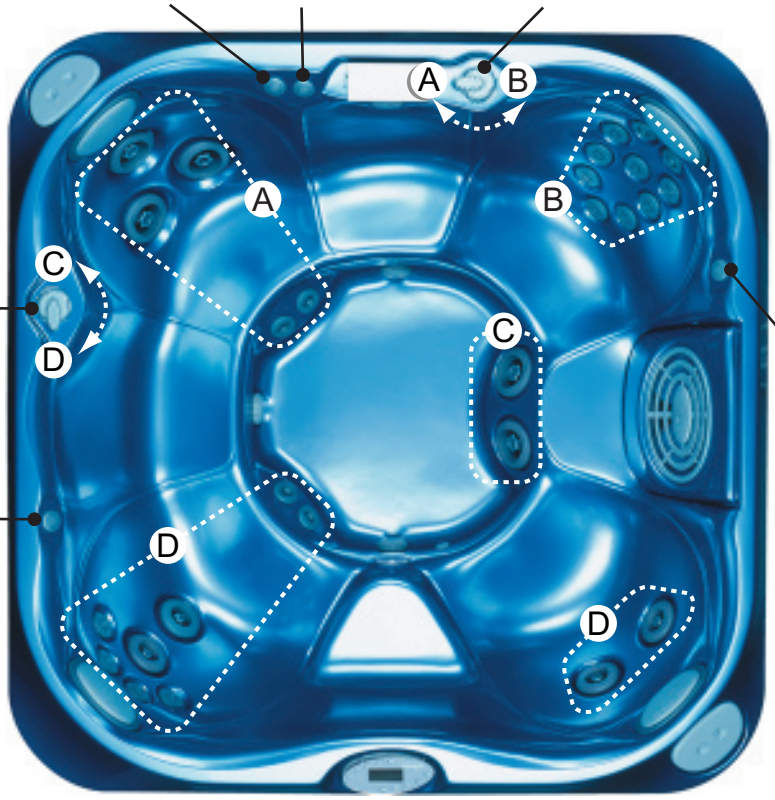
Dimensions/Specifications are Subject to Change Without Notice.

Jet Selector / Air Control Operation Diagram

Air Control 1:
Opens / Closes
Air Inlet to Jet
Group A

Air Control 2:
Opens / Closes
Air Inlet to Jet
Group C

Jet Selector 1:
Directs Jet Pump 1
Output Between Jet
Groups A or B.



Jet Selector 2:
Directs Jet Pump 2
Output Between
Jet Groups C or D.

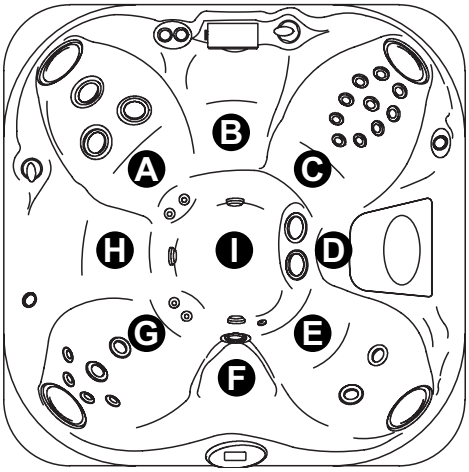
Air Control 4:
Opens / Closes
Air Inlet to Jet
Group D

Air Control 3:
Opens / Closes
Air Inlet to Jet
Group B

Seat Depths

A = 25.50" (64.8cm)
B = 24.00" (60.1cm)
C = 28.50" (72.4cm)
D = 23.00" (58.4cm)
E = 27.50" (69.9cm)
F = 19.75" (50.2cm)
G = 27.00" (58.6cm)
H = 25.75" (65.4cm)
I = 34.00" (86.4cm)

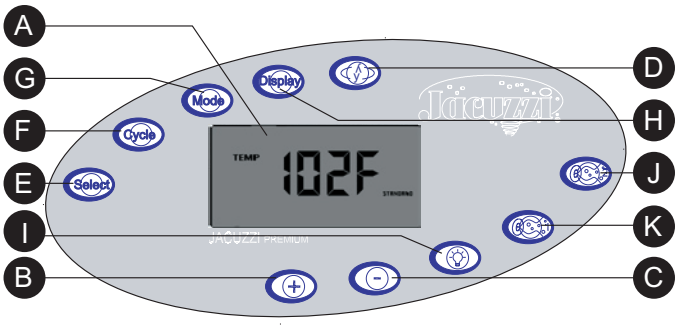
Listed Dimensions Represent Distance from Top of Acrylic to Lowest Point in Seat.



Dimensions/Specifications are Subject to Change Without Notice.

4.0 Main Control Panel Functions

Panel Functions:



A. LCD Display: can display current water temperature (default display), water temperature setpoint, selected filtration mode, programmable functions, function icons and error messages.

B. Warmer Button (⊕): increases water temperature setpoint.

C. Cooler Button (⊖): decreases water temperature setpoint.

D. View Button (◈): rotates the main 4-digit display 180º for the best viewing angle while in or out of the hot tub.

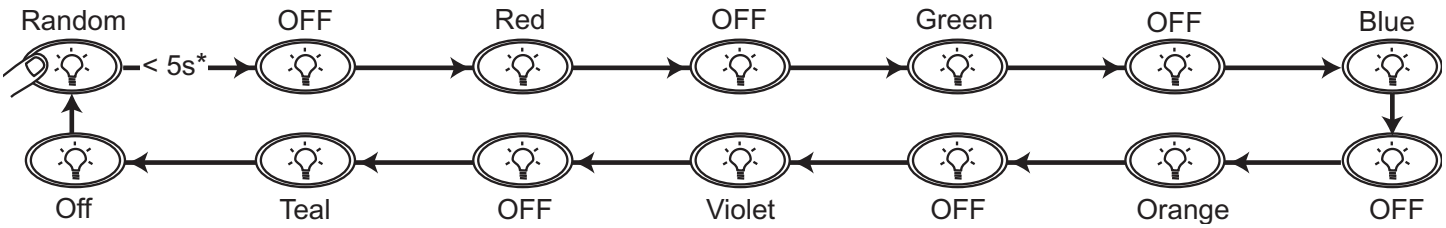
E. Select Button (Select): scrolls display through filter cycle programming features.

F. Cycle Button (Cycle): accesses filter cycle program mode and advances to the next cycle.

G. Mode Button (Mode): switches between standard and economy modes (see section 6.2, page 26).

H. Display Button (Display): displays time of day. Initiates time setting and locking functions.

I. Light Button (☼): controls underwater light illumination as illustrated below:



J. Pump 2 Button (◎): controls pump 2 as follows, press once to turn on high speed; a second time to turn off. *J-380 Pump 2 Button sequence: 1st press turns <u>on</u> pump 2; a 2nd press turns <u>on</u> pump 3; a 3rd press turns <u>off</u> pump 2; a 4th press turns <u>off</u> pump 3.*

K. Pump 1 Button (◎): Controls pump 1 as follows, press once for low speed; a second time for high speed; and a third time to turn off.

Operation Details:

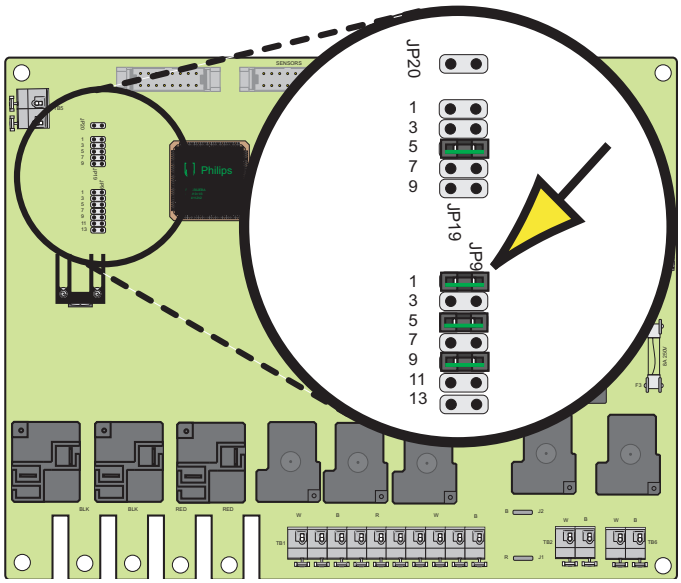
- Temperature Adjustment: 80 to 104ºF (26 to 40ºC).
- Underwater Light Operation: the light runs for 1 hour, then shuts off for increased bulb life.
- Jet Buttons Operation: the jets run for 20 minutes after activated, then turn off automatically to conserve energy. Simply press a jet button again to continue operation for an additional 20 minutes.

5.0 Troubleshooting Using The Control Panel

5.1 Control Panel Displays

Complete operating instructions for the control panel can be found in the user's manual. The following descriptions explain changes that result from installing the service jumper JP9 #1 on the circuit board (fig. 1). This jumper and the changes it causes are not mentioned in the user's manual.

fig. 1



The hot tub's control system constantly monitors the hot tub, the line voltage and the temperature sensors for proper operation. When anything goes wrong, the control panel displays a message for the user which may result in a service call. Upon arriving at the owner's spa, the technician can install the service jumper JP9 #1 on the circuit board and display information about line voltage and operating temperatures.

5.2 Control Panel Default Display

The default display (with or without the service jumper installed) shows the actual water temperature. Pressing either (+) or (-) once will display the set temperature. While the water temperature setpoint is displayed, pressing either (+) or (-) within 3 seconds will cause the set temperature to increase or decrease by 1º for each press. Three seconds after the desired temperature is set, the display defaults back to show the actual water temperature.

fig. 2

5.3 Control Panel Status And Error Messages

The jet indicators will display in one of two ways (fig. 2):

1. A **Flashing** indicator means the function has been automatically activated.
2. A **Solid** indicator means the function has been manually activated.

These Messages may appear, with or without the service jumper installed:

ILOC Hot tub deactivated. Check the interlock jumper located in the sensor harness (section A15, page 60).

LOC Hot tub control has been locked by the user by pressing the (Display), (Mode) and (+) buttons within 3 seconds. Press (Display), (Mode) and (-) within 3 seconds to unlock the panel.

Hold Control panel and remote panel are temporarily deactivated. Buttons have been pressed too often in too short a period of time. Do not press any buttons for 30 seconds. The control panel and remote panel will autimatically return to normal operation.

Hot The thermistor on the load box circuit board has detected a temperature of 180ºF (82ºC). ***Revision 9.50A Eproms only! Discontinued on Revision 9.50B Eproms.***

FLO When blinking, heater is deactivated, pump is on, and flow switch is open. When lit solid, pump is off, flow switch is closed, and all other functions are deactivated except freeze control. These problems are caused by either the lack of proper water flow or a malfunctioning flow switch. *See section A5 (page 52).*

FLO2 Closed or shorted flow switch at system start up (system disabled). The flow switch is non-functional or closed when power is first turned on to the spa.

ICE Potential freeze condition 55ºF (13ºC) detected. Pump 1 activates followed by pump 2 (and pump 3 on J-380) after 10 seconds in high speed. Both pumps (all 3 on J-380) stay on for a minimum of 11 seconds or until the water temperature rises to 65ºF (18ºC) and the danger of freezing passes. *See section A4.1 - A4.3 (pages 51-52).*

ICE1 JP20 on the circuit board has been jumped. All pumps are activated and continue to run until the circuit is opened.

ICE2 Same potential freeze condition as “ICE”, but “ICE 2” activates whenever the hot tub is in “FLO 2.”

Sn 1 Heater deactivated. High Limit sensor located on the heater tube is nonfunctional. *See section A4.1 (page 51) for troubleshooting details using the test plug. Refer to section A16 (page 60) for sensor testing instructions using an ohmmeter.*

Sn 3 Heater is deactivated. Main temperature sensor located in the filter well is nonfunctional. *See section A4.1 (page 51) for troubleshooting details using the test plug. Refer to section A16 (page 60) for sensor testing instructions using an ohmmeter.*

OH Heater deactivated. Overheat condition exists - maximum water temperature of 112ºF (46ºC) has been exceeded. The pumps will run for a minimum of 6 minutes to circulate the water. After 6 minutes, the pumps will go off but the “OH” error display will continue to flash until the hot tub is cooled to approximately 106ºF (41ºC). Consult the “Troubleshooting” section of the owner’s manual and *refer to section A4.1 (page 51).*

---- (Dashed line and no backlight on LCD) Hot tub deactivated. Problem detected which can cause damage to components. This is called the WATCHDOG. *See section A4.1 (page 51).*

PnL Faulty communications between the control panel and the circuit board. Broken cable or connector not properly plugged into the circuit board. **This is usually corrected by reconnecting the cable or connector.**

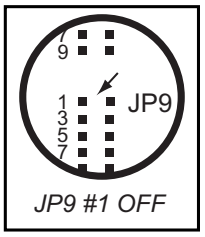
E888 Erroneous error code. When this happens, call Technical Service. Note: displayed error message may vary (E followed by three digits).

COOL The temperature of the water is 20ºF (11ºC) below the set temperature. All pumps and the heater will come on and stay on until the water temperature rises to within 15ºF (8ºC) of the set temperature.

Pl.9 The test plug has been left installed for longer than 15 minutes, this will deactivate the heater.

5.4 Control Panel Displays Without Service Jumper Installed (fig. 3)

fig. 3



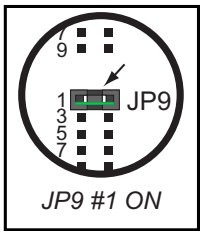
JP9 #1 OFF

1. Default Display: Actual water temperature.
2. Press DISPLAY (Display) once: Time of Day.

5.5 Control Panel Displays With Service Jumper Installed (Trouble Log)

For personal safety and to avoid any possibilty of "confusing" the control panel logic, turn off power to the hot tub before installing the service jumper (fig. 4). To scroll through the Trouble Log, press the DISPLAY (Display) button as follows:

fig. 4



JP9 #1 ON

1. Default: Actual water temperature (same as without service jumper)
2. Press DISPLAY (Display) once: Time of day (same as without service jumper)

Note: Subsequent pressing of the DISPLAY (Display) button (each press within 5 seconds of the previous) yields displays 3 through 17 below. If more than 5 seconds elapses between each press, the LCD will default to display #1 and read actual water temperature.

Line Voltage:

3. Highest line voltage % since installation or last service reset (e.g. 100% = 240VAC)
4. Present line voltage % (e.g. 110% = 240VAC + 24 = 264VAC)
5. Lowest line voltage % since installation or last service reset (e.g. 90% = 240VAC - 24 = 216VAC)

Note: If two successive displays have the same value, for example, highest line voltage = present line voltage, the LCD will not appear to change. It will seem like pressing the DISPLAY (Display) has no effect.

Hi-Limit Sensor

6. ---- This display indicates the hi-limit sensor temperature displays are next
7. Highest temperature detected by the hi-limit since installation or last service reset (e.g. 105ºF/41ºC)
8. Present temperature being detected by the hi-limit sensor (e.g. 102ºF/39ºC)
9. Lowest temperature detected by the sensor since installation or last service reset (e.g. 62ºF/17ºC)

Load Box Temperature ***(Revision 9.50A Eproms only)***

10. ---- This display indicates the control system temperature displays are next. These temperatures are measured by a sensor on the circuit board.
11. Highest temperature detected inside the load box since installation or last service reset (e.g. 140ºF/60ºC)
12. Present temperature inside the load box (e.g. 105ºF/41ºC)
13. Lowest temperature detected inside the load box since installation or last service reset (e.g. 50ºF/10ºC)

Temperature Sensor ***(Revision 9.50B Eproms only)***

10. ---- This display indicates the temperature sensor displays are next. These temperatures are measured by a sensor in the filter well.
11. Highest temperature detected by the temperature sensor since installation or last service reset (e.g. 105ºF/41ºC)
12. Present temperature sensor reading (e.g. 105ºF/41ºC)
13. Lowest temperature detected by the temperature sensor since installation or last service reset (e.g. 62ºF/17ºC)

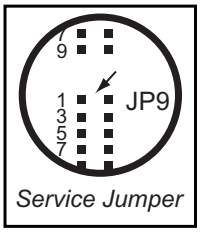
Line Frequency

14. ---- This display indicates the line frequency (Hz) will be displayed next
15. Present line frequency (e.g. 60H = 60Hz / 50H = 50Hz)
16. pH adjustment factor (option discontinued)*
17. Return to default: shows actual water temperature (e.g. 102ºF/39ºC)

** Any displays following the pH Adjustment factor (step 16) are for discontinued options.*
Note: reset trouble log after the circuit board is replaced by pressing the COOLER ( ) button while each value is displayed.

5.6 Programming Control Panel Without Service Jumper Installed

fig. 5



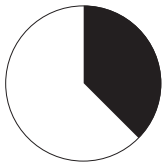
Service Jumper

Setup parameters 5.6A - 5.6D below can be programmed into the control system while the service jumper (JP9 #1) is not installed (fig. 5). Programming is done through the control panel keypad.

5.6A Programming The Time Of Day

The programming mode is entered as follows:

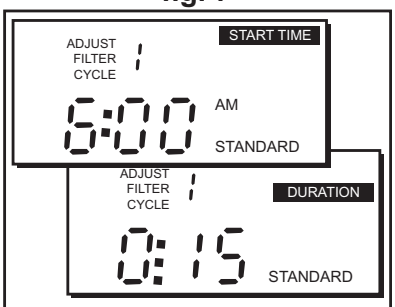
fig. 6


Program Time of Day

1. Press DISPLAY, MODE, DISPLAY buttons within 5 seconds of each other. A number representing the HOUR will display, followed by AM or PM.
2. Press WARMER or COOLER button within 5 seconds to increase or decrease the HOUR display.
3. Press DISPLAY button to advance to MINUTES display.
4. Press WARMER or COOLER button within 5 seconds to increase or decrease MINUTES display. After 5 seconds of keypad inactivity the display will return to normal.

Note: With the service jumper JP9 #1 installed, you would program Hours, Minutes, Month, Day, Year and Day Of Week. Refer to section 5.7 (page 25) under the heading "Programming Control Panel With Service Jumper Installed."

fig. 7



Displays shown for example purposes only, actual displays will vary.

5.6B Programming Filter Cycles

Two separate aspects of the filtration cycle can be programmed:
1) The time of day at which the cycle begins; 2) The duration of the cycle.

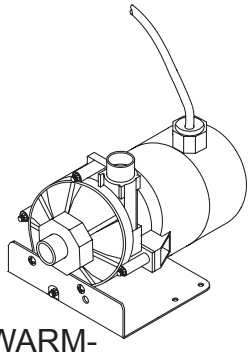
The programming mode is entered as follows (fig. 7):

1. Press the CYCLE button to enter the filter cycle programming mode. The LCD display annunciator reads "START TIME" in the upper right corner. This means the system is ready to accept changes to the displayed start time. The large 4-digit display shows the currently programmed start time for filter cycle 1.
2. Press WARMER or COOLER to adjust the filter cycle start time in 30 minute increments.
3. Press SELECT button to change the display annunciator from "START TIME" to "DURATION". With each press, the display alternates, showing the currently programmed start time and duration. Press WARMER or COOLER button to adjust the displayed duration setting in 15 minute increments.
4. Press CYCLE button to advance to the next filter cycle display. Repeat steps 2-3 for each cycle.
5. Press DISPLAY button to save your settings and make the filter cycle display disappear; the display returns to normal operation and reads the actual water temperature.

At anytime, you may check any filter cycle's program by first pressing the CYCLE button and then moving through the menu by pressing the SELECT button. The programming is changed only by pressing either the WARMER or COOLER button during this process.

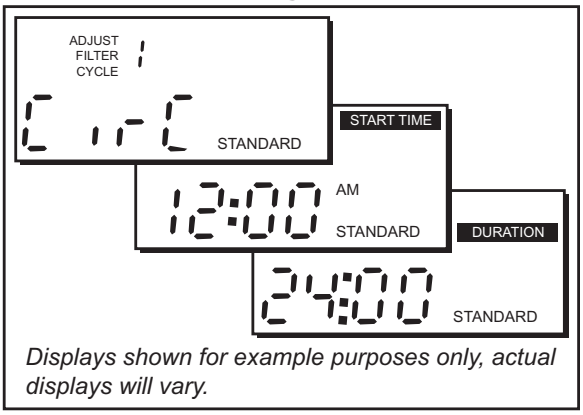
5.6C Programming The Circulation Pump

The circulation pump is programmable on all LCD models.
The programming mode is entered as follows (fig. 8):



1. Press CYCLE button five times until "CirC" displays on the large 4-digit display.
2. Press SELECT button once to display the circulation pump start time; then press WARMER or COOLER button to adjust in 30 minute increments.
3 Press SELECT button again to display the circulation pump duration; then press WARMER or COOLER button to adjust in 1 hour increments (If no buttons are pressed within 30 seconds, the display will return to normal operation and read the actual water temperature). The factory duration setting is 24 hours.
4. Press DISPLAY button once to save changes and recall the standard water temperature display. If no buttons are pressed within 30 seconds after performing step 3, changes are stored in memory and the standard water temperature display is recalled automatically.

fig. 8



Displays shown for example purposes only, actual displays will vary.

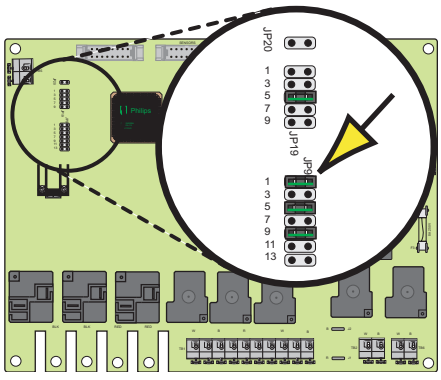
5.6D Locking The Filter Cycles

You may keep the filter cycle program from being accidentally altered by electronically locking it. To accomplish this, press the CYCLE button, then within 30 seconds, press DISPLAY, MODE and the WARMER buttons within 5 seconds of each other. A padlock symbol appears on the upper left hand corner of the display. In this state, the status of the programmed cycle may be checked, but not altered.

LOCKED

5.7 Programming Control Panel With Service Jumper Installed

fig. 13

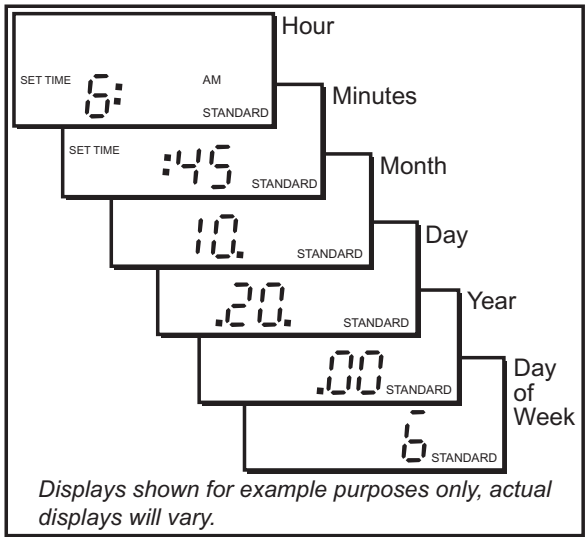


Signaturing the Circuit Board:
In addition to programming the TIME OF DAY and FILTER CYCLES (page 24), four additional parameters can be programmed with the service jumper JP9 #1 installed (fig, 13): MONTH, DAY, YEAR and DAY OF WEEK. These parameters are programmed immediately following the MINUTES in the setup menu.

To program MONTH, DAY, Year and DAY OF WEEk (fig.14, next page):

1. Press DISPLAY, MODE and DISPLAY buttons within 5 seconds of each other. A number representing the current HOUR will display, followed by AM or PM.
2. Press DISPLAY button once to advance to the MINUTES display.
3. Press DISPLAY button once to advance to the date display. A number representing the current MONTH is now displayed (example: January=01). Press WARMER or COOLER to adjust the displayed MONTH.
4. Press DISPLAY button once to advance to DAY of month. Press WARMER or COOLER to adjust displayed DAY of month.
5. Press DISPLAY button once to advance to YEAR display. Press WARMER or COOLER to adjust displayed YEAR.
6. Press DISPLAY button once to advance to DAY OF WEEK display. Press WARMER or COOLER to adjust displayed DAY OF WEEK. (Example: Sunday=1, Monday=2.)
7. Press DISPLAY button once or wait 5 seconds to return to the actual water temperature display.

fig. 14



Displays shown for example purposes only, actual displays will vary.

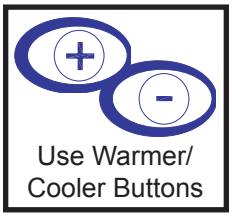
Note: Remember to resignature (DAY, DATE and YEAR) after every circuit board replacement.

6.0 Additional Control Panel Functions

6.1 Temperature Setting

To enable the set temperature display:

1. Press WARMER or COOLER button while the current water temperature is displayed. The “SET TEMP” annunciator appears indicating the mode is enabled.
2. Press WARMER or COOLER button within 3 seconds to increase or decrease set temperature by 1º per button press.
3. After 3 seconds of keypad inactivity the display will return to the actual water temperature and the new temperature setting will be maintained.



Use Warmer/ Cooler Buttons

6.2 Selecting Standard/Economy Modes

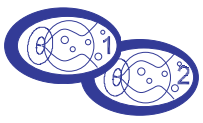
The hot tub is either in standard or economy mode as indicated by the LCD display annunciator. Press MODE to switch between either mode, as desired.

Use Mode Button

6.3 Selecting Jets Speed

To select jet speeds:

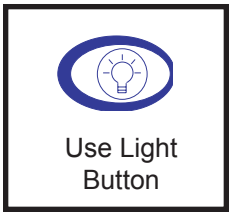
1. Press JET 1 button once for low speed; a second time for high speed; a third time to turn off.
2. Press JET 2 button once for high speed; a second time to turn off.
   J-380 models: press JET 2 button once to turn <u>on</u> Pump 2 high speed; a second time to turn <u>on</u> Pump 3; a third time to turn <u>off</u> Pump 2; a fourth time to turn <u>off</u> Pump 3.



Use JET 1/ JET 2 Buttons

Note: Anytime a pump has been manually turned on by selecting either JET button, it will automatically turn off after approximately 20 minutes. If at this time you desire more jet operation, simply turn the jet pump back on.

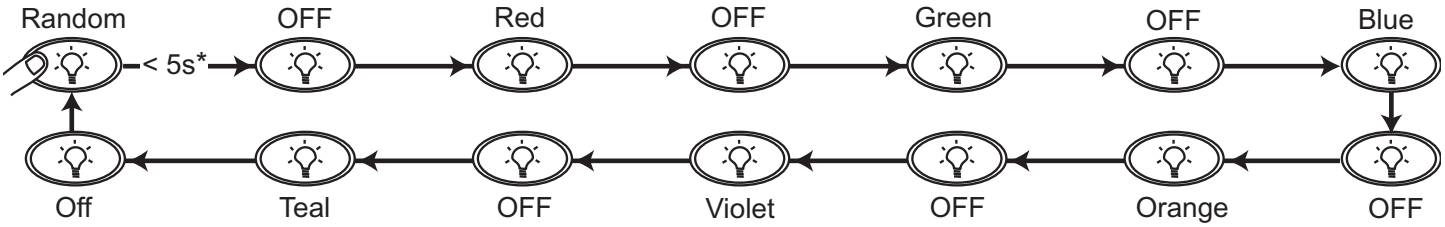
6.4 Multi-Color LED Light Operation



To turn on multi-color light and select color press the LIGHT button repeatedly to select each color option as follows:

Note: Each press of the LIGHT button must occur within 5 seconds of the previous to advance through the entire color selection sequence. If more than 5 seconds elapse between two button strokes, the color sequence resets and starts over at "Random." Random mode changes colors randomly every 8 to 20 seconds.

Anytime the light has been manually activated, it will automatically turn off after approximately 1 hour. If at this time you desire more light operation, simply turn the light back on.



6.5 Locking The Control Panel

To enable the lock panel function, press DISPLAY, MODE and WARMER buttons within 3 seconds of each other. A padlock symbol appears on the upper left corner of the display, then the display returns to the current water temperature.

Note: When the control panel is locked, the panel is unable to accept any function except, A) viewing settings, B) changing modes from standard or economy, C) setting the time of day, or D) accepting the unlock control panel sequence below. Locking the control panel also disables the ability to activate the temperature lock or filter lock options. If either temperature lock or filter lock function is executed first, followed by the lock panel sequence, the lock panel sequence overrides the previously set temperature lock or filter lock condition. Only one unlock panel sequence is required to unlock all panel functions and/or previously overridden filter lock or temperature lock conditions.

6.6 Unlocking The Control Panel

To enable the unlock control panel function, press DISPLAY, MODE and COOLER buttons within 3 seconds of each other. The padlock symbol will disappear from the upper left display corner when disabled.

6.7 Locking The Temperature Setting

To enable the temperature lock function:

1. Press WARMER or COOLER button while the current water temperature is displayed. The "SET TEMP" indicator appears indicating the mode is enabled.
2. Press DISPLAY, MODE and WARMER buttons within 3 seconds to enable the temperature lock sequence. The "Locked" padlock symbol appears on the upper left display corner, then the display returns to the current water temperature.

6.8 Unlocking The Temperature Setting

To disable the temperature lock function, simply press DISPLAY, MODE and COOLER buttons within 3 seconds of each other. The padlock symbol will disappear from the upper left display corner when disabled.

6.9 Locking The Filter Cycles

You can prevent the filter cycle program from being accidentally altered by electronically locking it.

To lock the filter cycle program:

1. Press CYCLE button, then within 30 seconds,
2. Press DISPLAY, MODE and WARMER buttons within 3 seconds of each other. The “Locked” padlock symbol appears on the upper left corner of the LCD display, then the display returns to the current water temperature. In this state, the status of the filter cycle program may be checked, but not altered.

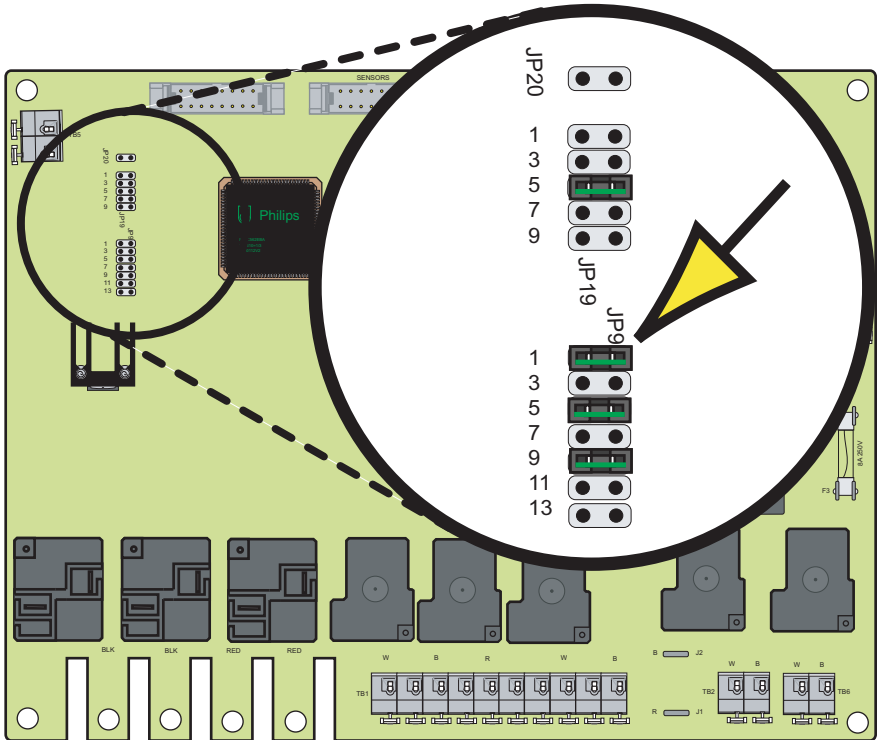
6.10 Unlocking The Filter Cycles

To unlock the filter cycle program, simply press DISPLAY, MODE and COOLER buttons within 3 seconds of each other. The padlock symbol will disappear from the upper left display corner when disabled.

7.0 Understanding Circuit Board Pin Assignments

7.1 JP9 Jumper Functions (fig. 15)

fig. 15



1. Position #1: This is the service jumper which allows access to the trouble log and to additional “signaturing the board” programming options (see section 5.7, page 25).

3. Position #3: This is the interlock jumper which bypasses the interlock circuit. (The interlock circuit is normally jumped in the sensor harness connector J6.)

5. Position #5: Not used at this time.

7. Position #7: This is the 60Amp logic jumper. When installed, it enables 60Amp logic which allows the heater to remain on while two pumps (only two pumps on J-380 models) are running in high speed. When uninstalled (50Amp logic), it will shut off the heater when more than one pump is running in high speed.

9. Position #9: Enables 2-pump logic when jumpered; enables 1-pump logic when not jumpered.

11. Position #11: This is the 30Amp logic jumper. When installed, it will shut off the heater when any pump is running in high speed. It overrides both 50 and 60Amp logic settings. When not installed, it allows for 50 or 60Amp logic settings.

13. Position #13: Not used at this time.

7.2 JP19 Jumper Functions (fig. 15)

1. Position #1: When installed, switches temperature readout from Fahrenheit (ºF) to Celcius (ºC).

3. Position #3: When installed, switches hot tub operation from 60Hz to 50Hz. The 50Hz operation setting is commonly used for export applications.

5. Position #5: When installed, it enables the logic for the Multi-Colored LED light kit.

7. Position #7: Not used at this time.

9. Position #9: Not used at this time.

7.3 JP20 Jumper Function (fig. 15)

1. When installed, this jumper enables “ICE 1” mode. All pumps are activated and continue to run until the circuit is opened.

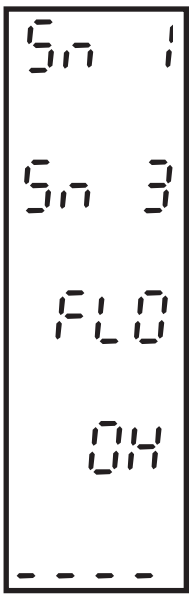
8.0 Protech LCD ProClear System Logic

All models with ProClear require Eprom revision 9.50A or B.

1. Standard mode is the default mode for all Protech LCD models. See section 6.2 (page 26).
2. A 24-hour circulation pump is used for filtration and heating.
3. The circulation pump will run unless the hot tub water reaches 2ºF (1ºC) above the set temperature, known as “Summer Logic”. Summer Logic only activates when the hot tub water is above 95ºF (35ºC).
4. The circulation pump will run for 2 hours a day at 12:00am (regardless of Summer Logic or circulation pump cycle programming) and cannot be altered.
5. The filter cycles run in Standard and Economy modes.
6. The cleanup cycle runs once a day at 12:00pm for 2 minutes in either standard or economy mode and cannot be altered. During the cleanup cycle, Pump 2 (and Pump 3 on J-380) runs for 1 minute and shuts off; followed by Pump 1 turning on for 1 minute and shutting off, unless the spa starts a filtration cycle at this time.
7. Optional ozone runs as long as the 24 hour circulation pump is running, unless Summer Logic is activated, or either JET button is pressed. If either JET button is pressed, the ozone will stay off for the duration of the function **plus an additional 5 minutes.**
8. The heater is always enabled in Standard mode and only during filter cycles in Economy mode.

9.0 Troubleshooting Without The Control Panel

fig. 16



9.1 Approaching The Hot Tub - First Steps

1. Check the control panel LCD for the following flashing error messages (fig. 16). *Refer to section A4.1 (page 51).*
2. If the Watchdog (----) error message is displayed, *refer to section A7 (page 54).*
3. Put the control panel in standard mode, set the temperature higher than the water temperature to force a heat call. If the hot tub goes into standard mode and the temperature was able to be set higher, go to step 5.
4. If the control panel does not seem to respond and voltage to the hot tub is OK, turn off the hot tub and connect a spare control panel. If a spare control panel does not work, *refer to section 9.4 "Nothing Works" (page 36).*
5. If there are no messages flashing on the display, go to step 6. If any message flashes, turn off power at the house breaker and install the test plug. Turn on the hot tub, return make sure it is in standard mode, then operate the test plug flow switch button. *Refer to sections A4.1-A4.3 (pages 51-52).* If no messages flash, replace the indicated component.
6. If no error messages are flashing, it appears that the control panel and the circuit board can communicate, at least on some level. Record voltage and temperature data and thoroughly check each hot tub function for proper operation.

9.2 No Heat Or Not Enough Heat

Note: In 2-pump models, the heater will not come on when both pumps are running in high speed unless there is a jumper installed at JP9 #7. On J-380's, The heater will not come on at all with all three pumps in high speed. Refer to section 7.1 (page 28).

Diagnostic Tools For Sections 9.2A - 9.2E

Clamp-on ammeter, voltmeter, ohmmeter, spare control panel, test plug.

Suggested Spare Parts For Sections 9.2A - 9.2E

Circuit board, control panel, temperature sensor, flow switch, heater assembly. Refer to page 61 for additional information.

Preliminary Setup And Observations

Perform preliminary setup and observations steps outlined in section 9.1 above. Any heat problems should show up during a thorough check of hot tub functions. The most common problems are described in the flow charts 9.2A - 9.2E shown on pages 31-35.

9.2A No Heat Or Not Enough Heat

• **Symptoms:** the circulation pump is turning, the panel indicator is lit, **the water is not getting hot.**
• **Configuration:** the water heater will not operate with both pumps running simultaneously in high speed when the circuit board is configuated for 50A operation. *Refer to section 7.1 (page 28).*

Standard Troubleshooting Approach

Put hot tub in standard mode and turn up temperature to initiate a heat call (wait 20-30 seconds for circuit board to respond). Is voltage present at the heater outputs? Test points 2 and 4. (Diagrams on pages 55 and 56.)

No → Is voltage present at heater input? Test points 6 and 7. (Diagram on pages 55 and 56.)

No → Replace or reconnect wires between heater input and TB1 (main power terminal block).

Yes → Replace circuit board.

Yes → Is voltage present at heater element? Test points 16 and 17. (Diagram on pages 55 and 56.)

No → Remove power to hot tub. Access the heater's thermal switch. Set voltage meter to 500-1000 VAC range.

Reapply power. Test thermal switch by connecting voltage meter across the terminals with a heat call present (see fig. 17). If 240 VAC exists, the switch is bad or heater is too hot*. If no voltage exists, the switch is good. Does the switch test Bad (Open)?

No → Replace or reconnect wires between heater output and heater element.

Yes → Remove switch from heater, and test for continuity. Replace switch if it tests bad*.

Yes → Is there current draw from the heater element? The heater element draws 20.6 - 25.2 Amps (22.9 Amps nominal) when operating correctly.

Check heater element for current draw with a clamp-on ammeter around one of the heater element wires.

No → Replace heater.

Yes → Current draw is proof that heater element is working. Make sure customer knows how to use control panel and heater. Ask about any possible error messages.

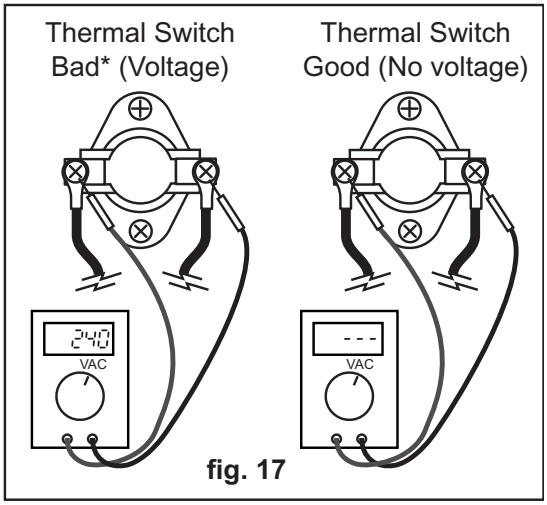


fig. 17

***CAUTION:** Switch will open if heater has overheated. Visually inspect heater tube for signs of discoloring or deformation. Replace heater assembly if visible signs of damage are apparent.*

Make sure circulation pump is moving water through the heater and heater is not running dry. Call technical support if condition persists.

Circuit Board Illustrations:
A. 2002+ Protech LCD, Pages 55 and 56

Danger: Electrical Shock Hazard Exists!
High Voltage Present On Circuit Board. Use Extreme Caution While Servicing Circuit Board.

9.2B No Heat Or Not Enough Heat

• **Symptoms:** the circulation pump is not turning, the panel heat indicator is not lit, **the panel reads solid FLO.**
• **Error Condition:** the pump is off, the flow switch is closed.

Standard Troubleshooting Approach

Turn power off. Remove sensor harness connector J6 (fig. 18). Then choose one of two testing methods below:
A. Install test plug (if available) or
B. Remove flow wires from sensor harness. See section A15 (page 60). Reinstall sensor harness without flow wires.

Turn power on Does hot tub reactivate?

No → Replace Circuit Board

Yes ↓

Turn power off. Test switch with ohmmeter for continuity across exposed switch pins (fig. 19). Does meter read continuity (0)?

No → Reinstall flow switch wires back into sensor harness. Check flow switch for intermitent operation or faulty wire connection.

Yes ↓

A. Visually inspect flow switch for debris interference. Remove debris if present.

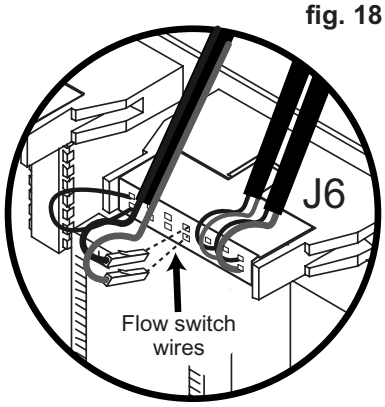
B. Test switch for continuity (0) when closed and for infinite when open (fig. 19). Does switch operate correctly?

No → Replace flow switch.

Yes ↓

Make sure flow arrow points in direction of flow (fig. 20). Retest system.

fig. 18



Remove flow switch wires from sensor harness connector J6. Refer to section A15 (page 60) for proper wire removal/ installation techniques.

fig. 19

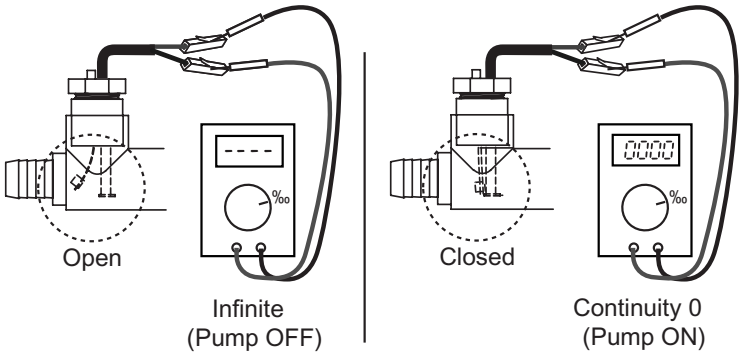
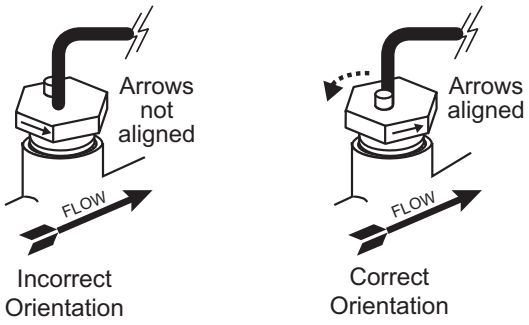


fig. 20



• **Symptoms:** the circulation pump is turning, **the panel reads solid FLO.**

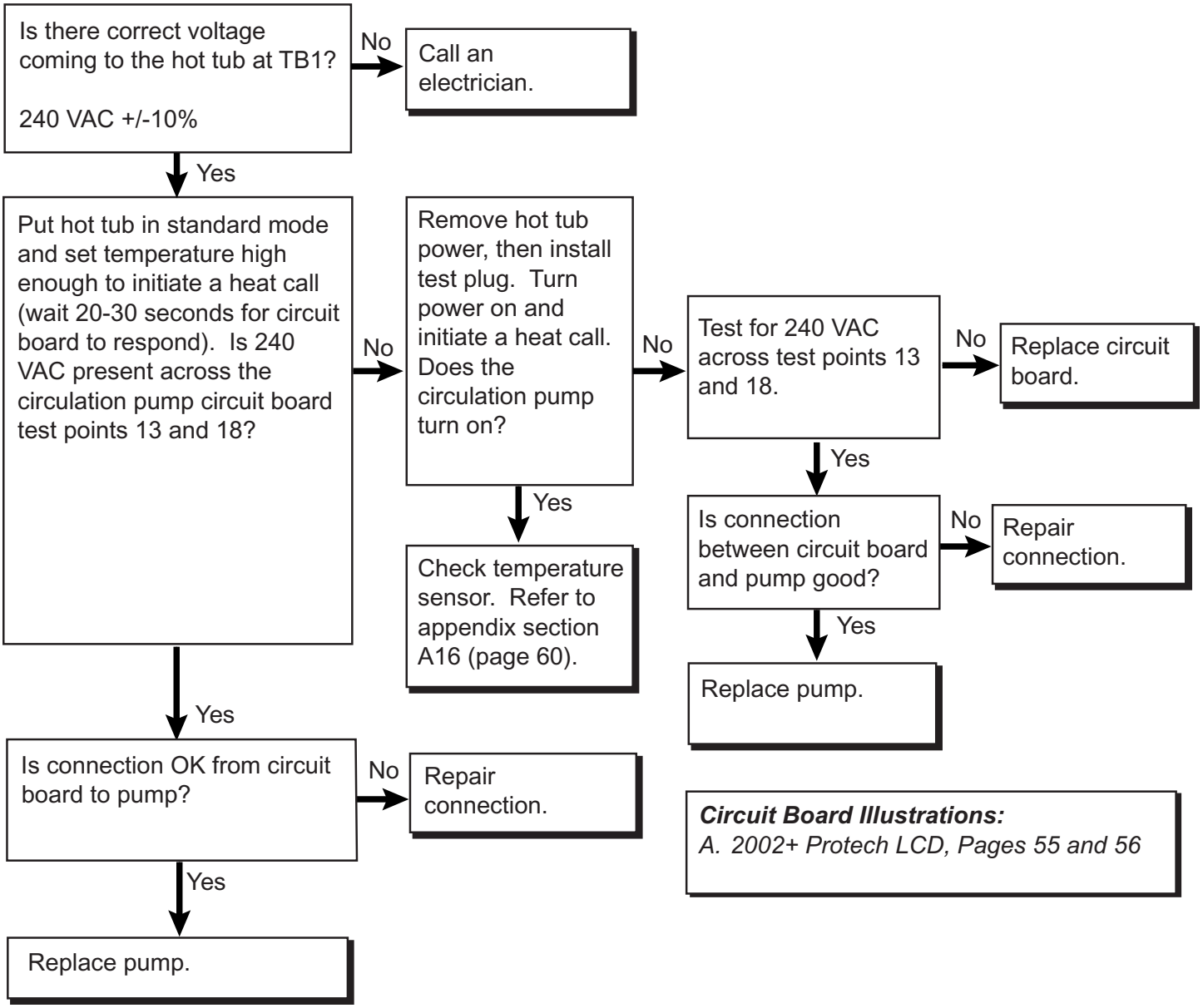
Standard Troubleshooting Approach

When the circulation pump is running and the control panel reads a solid FLO error, it means voltage is being supplied to the circulation pump when it shouldn't be. This scenario indicates the circuit board may be damaged and must be replaced or the circulation pump has been wired incorrectly. Replace the circuit board or correct the wiring for the circulation pump.

9.2C No Heat Or Not Enough Heat

• **Symptoms:** the circulation pump is not turning, the panel heat indicator is not lit, **the panel is flashing FLO.**
• **Error Condition:** the circuit board is trying to activate the circulation pump, the flow switch is open.

Standard Troubleshooting Approach


Is there correct voltage coming to the hot tub at TB1?
240 VAC +/-10%
No
Call an electrician.
Yes
Put hot tub in standard mode and set temperature high enough to initiate a heat call (wait 20-30 seconds for circuit board to respond). Is 240 VAC present across the circulation pump circuit board test points 13 and 18?
No
Remove hot tub power, then install test plug. Turn power on and initiate a heat call. Does the circulation pump turn on?
No
Test for 240 VAC across test points 13 and 18.
No
Replace circuit board.
Yes
Is connection between circuit board and pump good?
No
Repair connection.
Yes
Replace pump.
Yes
Check temperature sensor. Refer to appendix section A16 (page 60).
Yes
Is connection OK from circuit board to pump?
No
Repair connection.
Yes
Replace pump.
Circuit Board Illustrations:
A. 2002+ Protech LCD, Pages 55 and 56

Note: Refer to voltage and current charts on appendix pages 50-51 for expected voltage/current readings.

Danger: Electrical Shock Hazard Exists!
High Voltage Present On Circuit Board. Use Extreme Caution While Servicing Circuit Board.

9.2D No Heat Or Not Enough Heat

• **Symptoms:** the circulation pump is turning, the panel heat indicator is not lit, **the panel is flashing FLO.**
• **Error Condition:** the circulation pump is running, the flow switch is open.

Standard Troubleshooting Approach

Turn off hot tub power and install test plug. Put hot tub in standard mode and turn up temperature to initiate a heat call (wait 20-30 seconds for circuit board to respond). Verify circulation pump is running and water flow is present, then press test plug button.

Does heat indicator appear and FLO error disappear?

No → Replace circuit board.

Yes → Is connection between flow switch and circuit board OK?

No → Repair connection.

Yes →

A. Remove flow switch wires from sensor harness (fig. 21) connector J6. Refer to section A15 (page 60) for removal/ installation instructions.

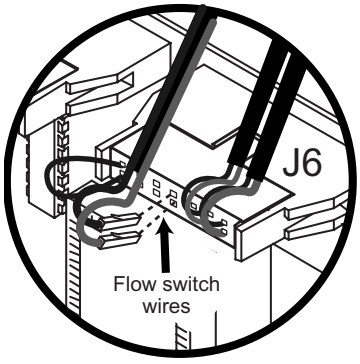
B. Visually inspect flow switch for debris interference. Remove debris if present.

C. Test switch for continuity (0‰) when closed and for infinite when open (fig. 22). Does switch operate correctly?

No → Replace flow switch.

Yes → Make sure flow arrow points in direction of flow (fig. 23). Retest system.

fig. 21



Remove flow switch wires from sensor harness connector J6. Refer to section A15 (page 60) for proper wire removal/ installation techniques.

fig. 22

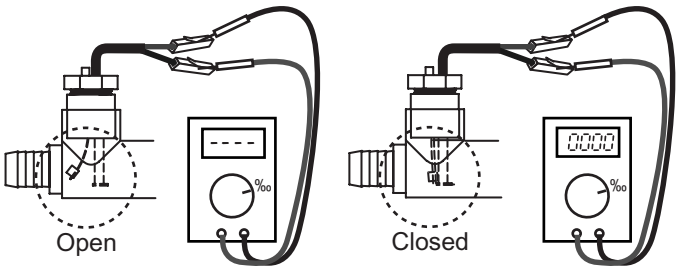
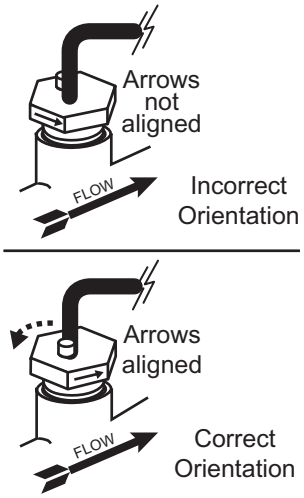


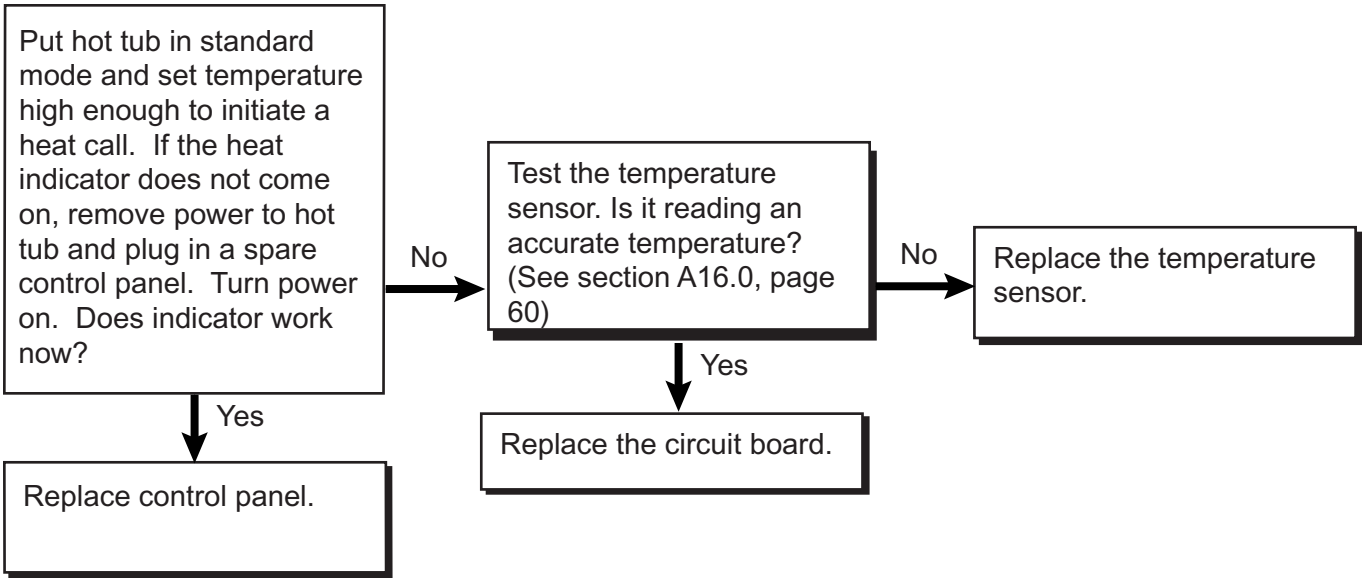
fig. 23



9.2E No Heat Or Not Enough Heat

• **Symptoms:** the circulation pump is turning, the panel indicator is not lit, **the panel is NOT flashing FLO.**

Standard Troubleshooting Approach


Put hot tub in standard mode and set temperature high enough to initiate a heat call. If the heat indicator does not come on, remove power to hot tub and plug in a spare control panel. Turn power on. Does indicator work now?
No
Test the temperature sensor. Is it reading an accurate temperature? (See section A16.0, page 60)
No
Replace the temperature sensor.
Yes
Replace the circuit board.
Yes
Replace control panel.

9.3 Intermittent Heating

As with all intermittent problems, routine measurements and LCD display indications are not trustworthy. The following procedure will eliminate the most probable causes.

It is important to explain to the customer how difficult intermittent problems are to locate. You will be doing a series of tests to eliminate the problem. Ask the customer to be patient and please cooperate by calling you back to inform you of the hot tub's status until the problem is corrected. It might be a good idea to review this STA with the customer. It may help he or she understand why it might take several callbacks to effect a repair.

Suspects: circuit board, temperature sensor, control panel, wiring connections, and partial water flow obstructions.

Diagnostic Tools:
Voltmeter and test plug

Suggested Spare Parts (Page 61):
Heater, circuit board, temperature sensor, flow switch, control panel.

Standard Troubleshooting Approach

1. Check the crimped wire connections to the heater. If burned, replace the heater wires. Verify that the heater connections are good on the circuit board.
2. Check the connections labeled "heater out" on the circuit board (test points 2 and 4). Refer to pages 55 and 56 for the circuit board layout. If possible, clean and renew the connections. If a relay is physically burnt at the connections, replace the circuit board.
3. Check the flow switch for proper and consistent mechanical operation. Observe the mechanical operation of the flow switch. *Refer to section A5 (page 52).*
4. Clean the connections where the panel plugs into the circuit board.
5. If all of the above items check out, ask the customer if the Sn3 error ever displayed. If the Sn3 error message has displayed, replace the temperature sensor.
6. Tell the customer what you have done, that you are not sure the problem has been fixed, and that you want to be called back immediately if the problem returns. Explain what you will do if the problem returns. Check back with the customer in a few days if you haven't been contacted.
7. If the customer calls back, then call Jacuzzi Premium Technical Support.

9.4 Nothing Works

Things to remember: when a system fails, there is probably only one, and only one problem. Verify power to the hot tub by testing across the main TB1 terminal block with a voltmeter for 240 VAC. Check for error messages. Displayed error messages usually indicate the problem.

Diagnostic Tools: Voltmeter and test plug

Suggested Spare Parts (Page 61): Fuses, control panel, circuit board.

Nothing Works (Panel Indicators Lit)

1. Check the interlock jumper in the sensor harness connector J6. *Refer to section A15 (page 60).*
2. Plug in a spare control panel. If it works, replace the panel.
3. Remove power from the hot tub, plug in the test plug, then turn power back on. If the control panel works at this time, the circuit board is good. Check the connections on the sensor harness and verify proper resistance of the temperature and hi-limit sensors. *Refer to section A16 (page 60).*
4. Check the transformer. *Refer to section A13 (page 59).*
5. Still no operation? Replace the circuit.

Nothing Works (Panel Dead)

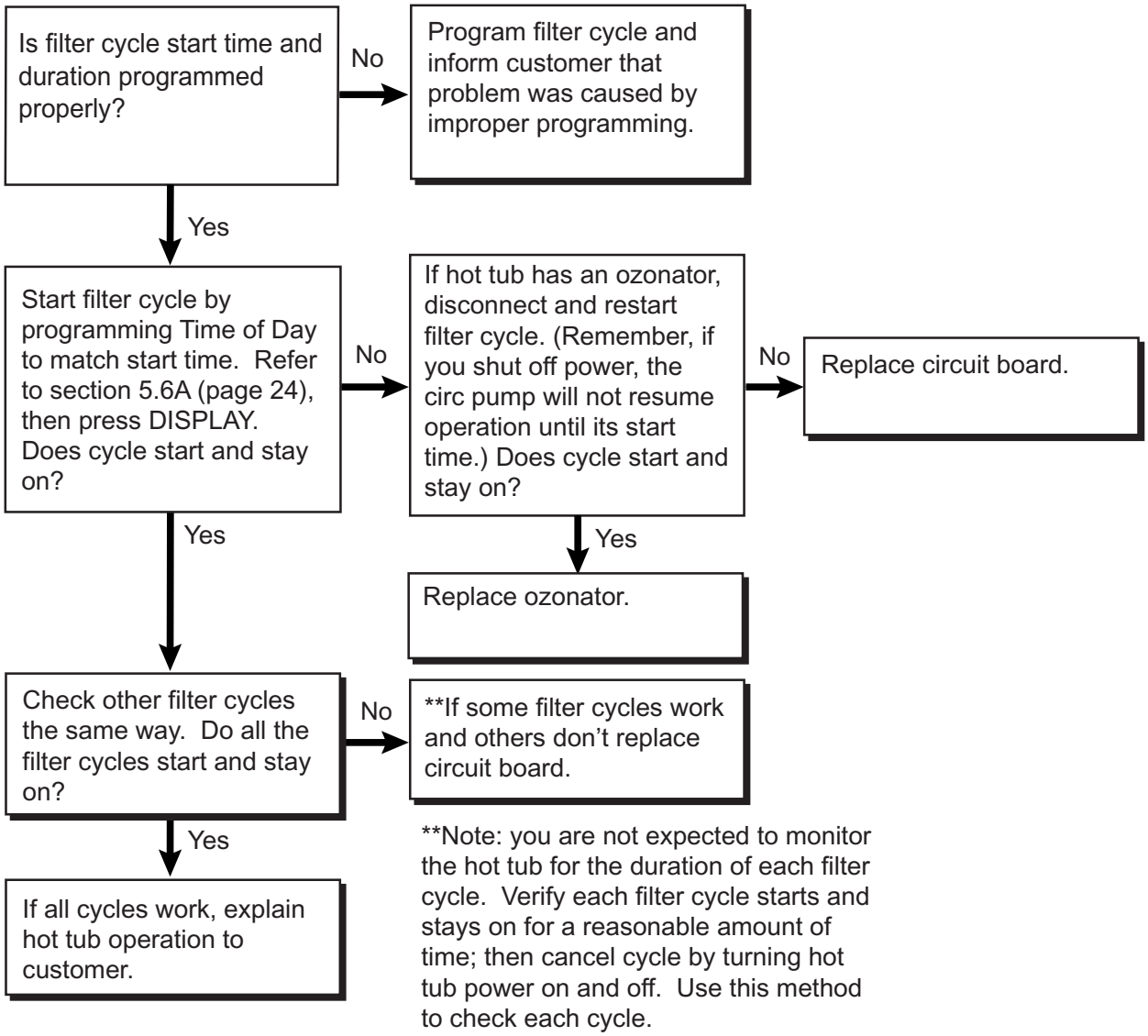
1. Check for proper voltage at the hot tub *(see section A2, page 50)*. Check for 240 VAC at TB1 on the main terminal block. *Refer to pages 55 and 56 for the circuit board illustrations.* If the voltage is not 240 VAC ±10%, consult an electrician.
2. Check for the WATCHDOG (----) on the control panel. *Refer to section A7 (page 54).*
3. Check for power at the transformer secondary. *Refer to section A13 (page 59).* If power exists on the transformer secondary, plug in a spare control panel. Still nothing? Replace the circuit board.
4. If no power exists at the transformer secondary, check for voltage on the transformer primary. *Refer to section A13 (page 59).* If voltage exists on the primary but is missing on the secondary, replace the transformer.
5. No power at the transformer primary indicates either an open 1.25 Amp or 30 Amp fuse, or a loose or disconnected wire. *Refer to section A6 (page 53).*

9.5 Hot Tub Doesn't Come On For Filter Cycle

Filter Cycle

Diagnostic Tools: None needed.
Suggested Spare Parts (Page 61): Circuit board, ozonator.

Standard Troubleshooting Approach


Is filter cycle start time and duration programmed properly?
No
Program filter cycle and inform customer that problem was caused by improper programming.
Yes
Start filter cycle by programming Time of Day to match start time. Refer to section 5.6A (page 24), then press DISPLAY. Does cycle start and stay on?
No
If hot tub has an ozonator, disconnect and restart filter cycle. (Remember, if you shut off power, the circ pump will not resume operation until its start time.) Does cycle start and stay on?
No
Replace circuit board.
Yes
Yes
Replace ozonator.
Check other filter cycles the same way. Do all the filter cycles start and stay on?
No
**If some filter cycles work and others don't replace circuit board.
Yes
If all cycles work, explain hot tub operation to customer.

**Note: you are not expected to monitor the hot tub for the duration of each filter cycle. Verify each filter cycle starts and stays on for a reasonable amount of time; then cancel cycle by turning hot tub power on and off. Use this method to check each cycle.

9.6 House Breaker Trips
The hot tub's current draw will vary depending on how it's circuit board is jumpered. Jumper options determine whether multiple functions can operate together.

If the house breaker trips, check the hot tub's current draw. If the jumpers are properly set and the current draw is within expected limits, the house breaker or wiring may be defective and need to be replaced or repaired. The hot tub's current draw at the breaker represents the sum of all enabled components. *Refer to section A3 (page 51) for current draws.*

If the hot tub's current draw is high, individual component current measurements must be made to determine which component is pulling excessive current. *Refer to section A3 (page 51).* Repair or replace the component which is drawing excessive current.

9.6A GFCI Tripping
If the GFCI trips, try disconnecting the heater and the pumps from the circuit board one at a time to find which component may be causing the GFCI to trip.

When a customer complains of intermittent GFCI tripping, these questions need to be answered before we just start replacing components on the hot tub. 90% of a GFCI's tripping problems are the direct result of improper wiring or installation.

1. Has the GFCI always tripped or has it just recently started tripping?

   • Has the hot tub just been installed?
   • Electricians are not as smart as they think are and the owner's cousin's nephew who's a painter really isn't a licensed electrician.
   • New deliveries cause 90% of all GFCI tripping problems.
   • Know what to look for when you approach this problem. *Refer to section A9-A11 (pages 55-56).*

2. How was the hot tub delivered?

   • Check for visible damage to all hot tub components.

3. What Brand of GFCI was installed?

   • Some brands are known to be more sensitive than others which can cause nuisance tripping.

4. When does it trip? At the start of a filtration cycle, etc., be specific.

   • They need to provide you with this information. Have them takes notes on when the hot tub trips. How often does it trip? Be specific. Intermittent tripping of the GFCI is very hard to pinpoint if you can't get specific information.

5. What size is the GFCI? 30(40 on J-380), 50 or 60 Amp?

6. What size is the wiring? 8-10 gauge for 30(40) Amp, 8-6 gauge for 50 Amp, 6 gauge for 60 Amp. All wiring must be done to Local and NEC code.

7. What kind of wire are they using, copper or aluminum?

   • Aluminum wire is <u>not</u> recommended.

8. Is the GFCI utilized at the main panel?

   • Verify how it is hooked up.
   • If you are not licensed to properly change the wiring, show the customer how it should be hooked up and have them call the electrician. *(Improper installation is not a warranty call which once corrected may involve you coming back to replace a component.)* **If there is a problem with the electrician understanding the correct hook up of the hot tub, have the electrician contact Jacuzzi Premium Technical Support.**

9. Is the GFCI and wiring dedicated only to the hot tub?

10. Are there any other devices hooked up to the hot tub; a light, extra outlet, etc.?

11. How long is the run from the main panel to the hot tub?

   • Longer runs require a wire size compatible to that length of the run.

12. Is there a disconnect or sub-panel in the run?

13. How is the disconnect hooked up? Be specific.

   • There needs to be FOUR wires (two hots, a neutral, and a ground) at the disconnect for the GFCI to properly function.

14. Is this a 3-wire or a 4-wire hook up?

   • The J-350 through J-380 are all 240 VAC, 3-wire hook ups.

15. Is there 240 VAC at the hot tub?

   • Refer to the model the customer has purchased and then confirm the hook up using the diagrams provided in sections A9-A11 on pages 55-56.

16. How are the wires connected at the GFCI?

   • 3-wire, 240 VAC hook ups **DO NOT USE A LOAD NEUTRAL OUT OF THE GFCI TO THE HOT TUB.**

17. Is the neutral wire hooked up on the GFCI?

   • In a 240 VAC only hook up, this will cause the GFCI to trip.

18. Where is the neutral wire hooked up at the GFCI?

   • The neutral “Pigtail” should go directly to the neutral bar.

19. Is the load neutral wire capped off or taped at the spa?

   • This will cause the breaker to nuisance trip; the wires can act like an antenna and pick up stray or inductive current.

20. What is the model and serial number of the hot tub?

    • This will help determine how the hot tub should be hooked up.

21. Did a licensed electrician hook up the hot tub?

    • **See question number one!**

22. What is the voltage at the hot tub?

    • **Always have your meter with you!**

23. What is voltage between the neutral wire and the ground?

    • **There should not be a neutral wire!**

24. What is the voltage between the two hot leads?

    • This should be 240 VAC, ±10%. If there is no voltage, then you have lost a hot leg or the GFCI has tripped. Verify voltage at the GFCI, if the GFCI is not tripped and you don't have 240 VAC at the hot tub, then the problem is between the GFCI and the hot tub. A licensed electrician should be called at this time.

25. What is the voltage between one hot lead to ground, and the other hot lead to ground?

    • This should be 120 VAC.

26. What is the voltage between one hot lead and the neutral?

    • **There should not be a neutral wire!**

27. Are the wires connected to the proper position inside the hot tub load box? Verifiy and be specific.

    • Wires incorrectly hooked up to the main terminal block will cause the GFCI to trip or the hot tub will not function properly.

28. What is the voltage at the hot tub when all of the components are energized?

    • Voltage to the hot tub should stay consistent with or without the components energized.

29. Are all of the connections tightened down properly?

    • Loose wires will cause them to get hot. Look for melted wire coverings or burnt connections.

30. Are there frayed or loose wires touching metal?

    • Any wires that are hot and are touching metal will trip the GFCI immediately.

31. Are there any sprinklers that will hit the equipment bay of the hot tub?

Eliminate The Components

32. Does the hot tub have an ozone unit attached to it or any type of sanitizing device?

    • Unplug or disconnect the unit and see if the GFCI will hold.

33. Does the hot tub have a blower in it? *(2001 and previous models only.)*

    • Disconnect the blower and see if the GFCI will hold. 2002+ models do not have blowers.

34. Check the heater first before you check any of the pumps.

    • The heater will be energized if there is a heat call. Disconnect *both legs* first before you try the pumps.

35. Is the hot tub equipped with a circulation pump? *(All 2002+ models are equipped so.)*

    • Unplug or disconnect the circulation pump and see if the GFCI will hold.

36. If the GFCI still trips, disconnect the main, two speed pump first, then the secondary, single speed pump if the hot tub has one.

37. Do you notice any water deposits near any of the motors or any other electrical devices?

    • Look at the area around the air controls. If water is backing up into the control, it will leak out, possibly onto an electrical component.

38. Is the control panel properly sealed as to not allow water to leak down onto the load box?

39. Are there any components, specifically the pumps, heater, ozone, etc., leaking?

40. Do you notice any corrosion around any of the components, specifically the heater, pumps, circulation pump, ozone, etc.?

41. What is the amperage draw of the hot tub with everything energized. Be specific.

    • Use a clamp on ammeter to determine the amperage draw.

42. What is the amperage draw of each individual component? Be specific.

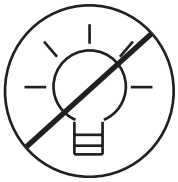
    • Again, use a clamp on ammeter to determine each components amperage draw.

    • If a component has excessive amperage draw, replace that component.

If you should need to contact Jacuzzi Premium Technical Support, these are questions that will be asked of you. It is also a good idea to have the “Troubleshooting Data Collection Form” (see example on page 63) filled out.

North American 60Hz Installations:
As of January 1, 1994, the National Electrical Code (NEC) requires a Ground Fault Circuit Interrupter (GFCI) on all hot tub installations in the US. A GFCI must be wired correctly or it will trip. Make sure the electrician has wired the GFCI according to the diagrams on page 57.

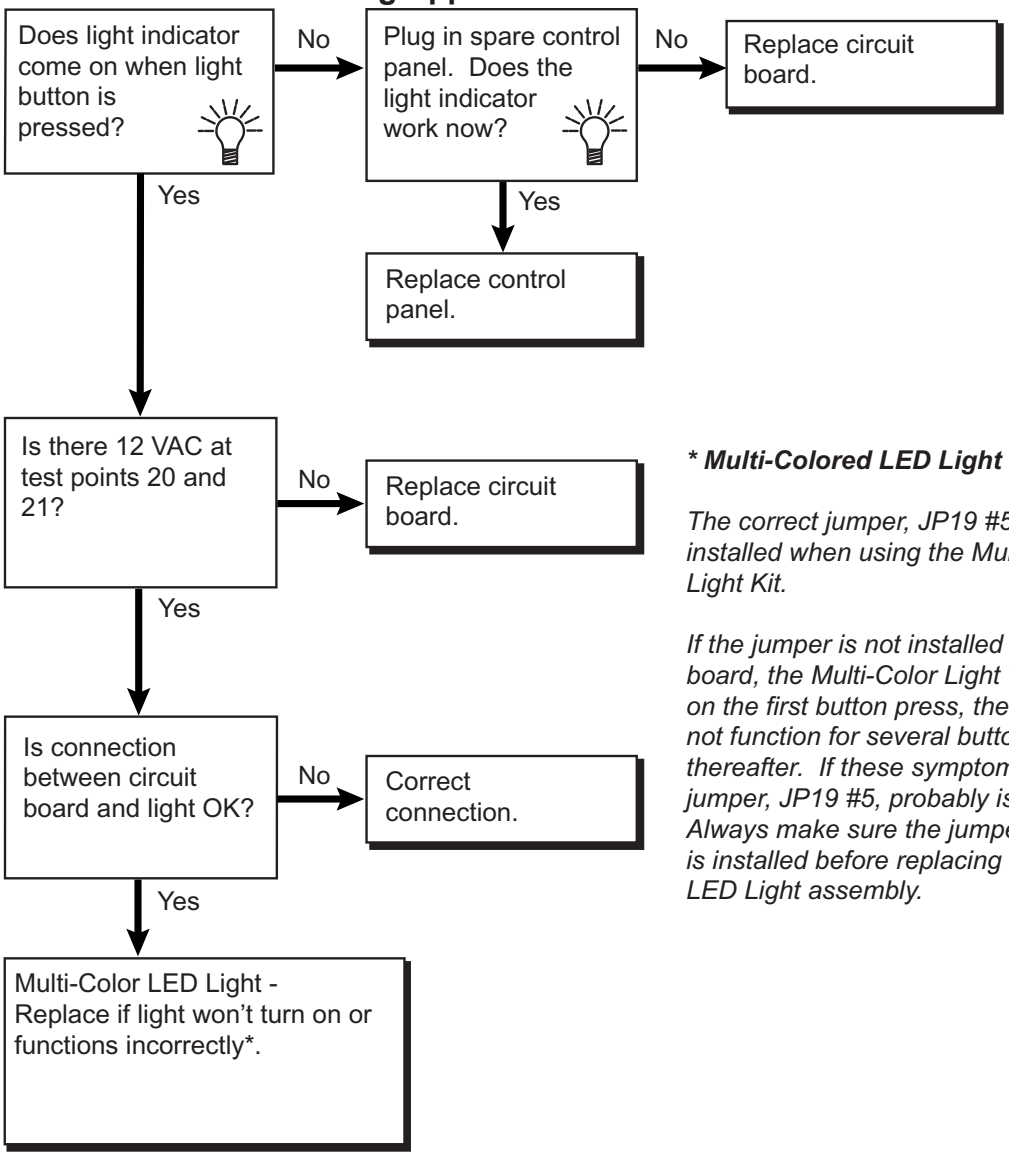
9.7 Hot Tub Light Will Not Come On



Diagnostic Tools: Voltmeter.

Suggested Spare Parts (Page 61): Control panel, circuit board, Multi-Colored LED light kit.

Standard Troubleshooting Approach


Does light indicator come on when light button is pressed?
No
Plug in spare control panel. Does the light indicator work now?
No
Replace circuit board.
Yes
Yes
Replace control panel.
Is there 12 VAC at test points 20 and 21?
No
Replace circuit board.
Yes
Is connection between circuit board and light OK?
No
Correct connection.
Yes
Multi-Color LED Light - Replace if light won't turn on or functions incorrectly*.

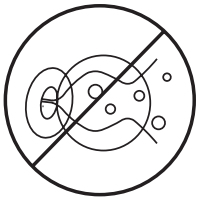
**** Multi-Colored LED Light Kit***

The correct jumper, JP19 #5, must be installed when using the Multi-Color LED Light Kit.

If the jumper is not installed on the circuit board, the Multi-Color Light will function on the first button press, then may or may not function for several button presses thereafter. If these symptoms exist, the jumper, JP19 #5, probably is not installed. Always make sure the jumper, JP19#5, is installed before replacing the Multi-color LED Light assembly.

Circuit Board Illustrations:
A. 2002+ Protech LCD, Pages 55 and 56

9.8 No Jets



This is a condition of constant zero water pressure. The first step in diagnosing the problem is to determine if the pump is actually turning. Once this determination is made, follow the appropriate portion of this S.T.A.

Diagnostic Tools: Voltmeter, spare control panel.

Suggested Spare Parts (Page 61): Control panel, circuit board, pump.

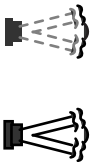
Pump Is Turning - Checking For A Flow Problem

1. Is the filter clogged?
2. Is there an obstruction in the plumbing line?
3. Check for an air lock (clear the air lock by opening the pump union on the discharge side or loosening the diverter cap, with the pump off).

Pump Not Turning;

Standard Troubleshooting Approach

Does the low speed jets indicator come on when jets button is pressed once? Does the high speed indicator come on when the JETS Button is pressed a second time?



No → Plug in spare control panel. Does jets indicator come on when jets button is pressed?

No → Replace circuit board.

Yes → Replace control panel.

Yes → Is voltage from circuit board to motor correct? Check for 240 VAC at recommended test points. See table at right for a listing of recommended test points.

No → Replace circuit board.

Yes → Is connection between circuit board and pump OK?

No → Reconnect wires.

Yes → Replace pump.

Recommended Test Points

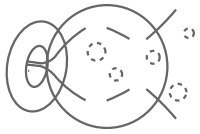
1. *Low Speed Pump 1 - test points 1 and 3 on circuit board*
2. *High Speed Pump 1 - test points 1 and 5 on circuit board*
3. *Pump 2 - test points are 8 & 10 on circuit board*
4. *Pump 2, J-380 - test points are 8 and 19 on circuit board*
5. *Pump 3, J-380 - test points are 6 and 10 on circuit board*

Circuit Board Illustrations:

A. 2002+ Protech LCD, Pages 55 and 56

Danger: Electrical Shock Hazard Exists!
High Voltage Present On Circuit Board. Use Extreme Caution While Servicing Circuit Board.

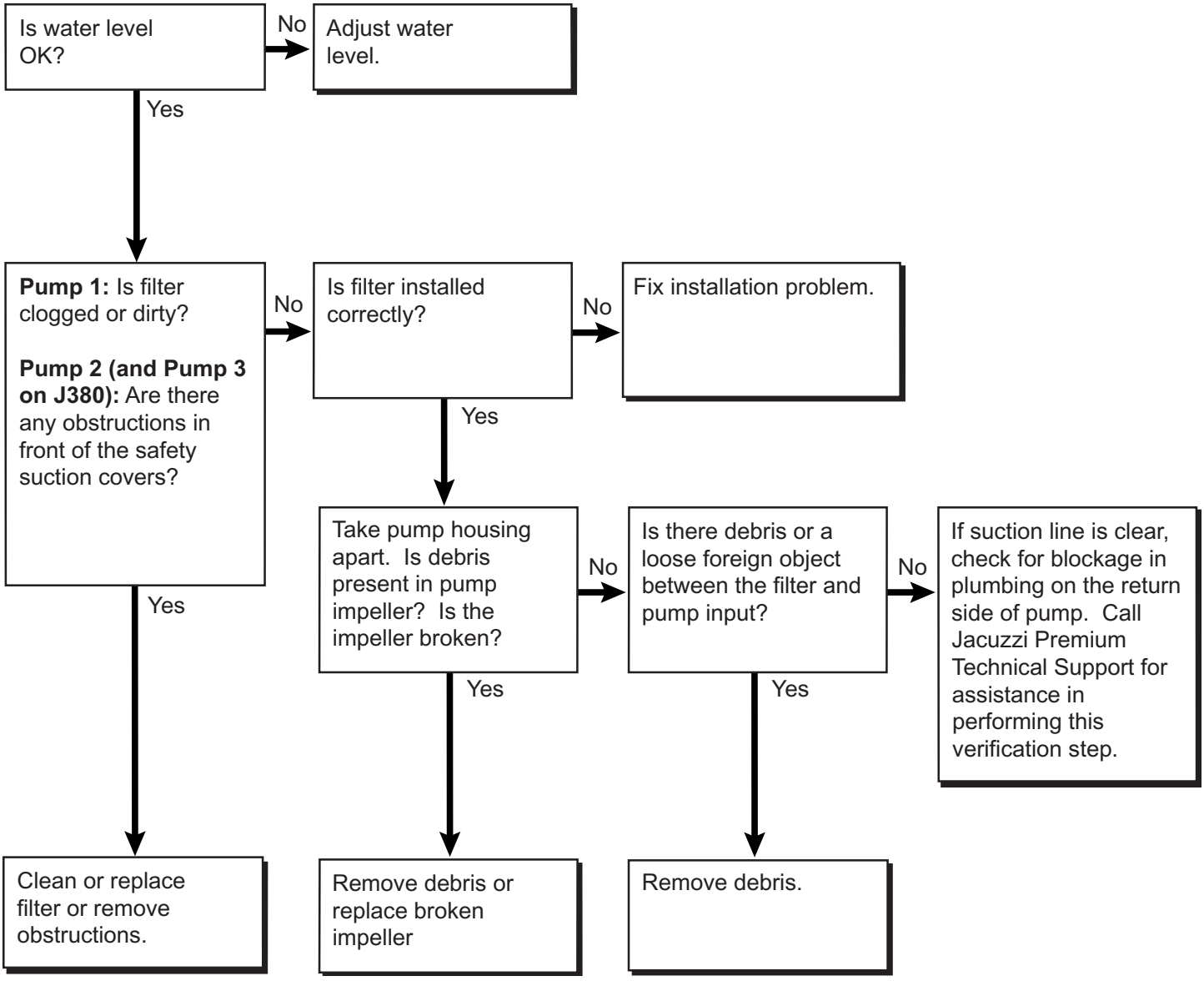
9.9 Weak Or Surging Jets



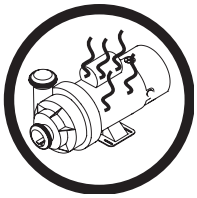
Weak or surging jets are usually caused by an insufficient water supply to the pump or a clogged or broken impeller. The water level may simply be too low, or there may be an obstruction in the water flow path to the pump or in the pump's impeller. *Before making a service call, ask the customer to verify that all jets are open and that there is sufficient water in the hot tub.*

Suggested Spare Parts (Page 61): Filter.

Standard Troubleshooting Approach


Is water level OK?
No
Adjust water level.
Yes
Pump 1: Is filter clogged or dirty?
Pump 2 (and Pump 3 on J380): Are there any obstructions in front of the safety suction covers?
No
Is filter installed correctly?
No
Fix installation problem.
Yes
Take pump housing apart. Is debris present in pump impeller? Is the impeller broken?
No
Is there debris or a loose foreign object between the filter and pump input?
No
If suction line is clear, check for blockage in plumbing on the return side of pump. Call Jacuzzi Premium Technical Support for assistance in performing this verification step.
Yes
Clean or replace filter or remove obstructions.
Yes
Remove debris or replace broken impeller
Yes
Remove debris.

9.10 Pump Runs And Quits During Jet Mode



This is usually a problem of the pump overheating. The pump motor incorporates a thermal cutout that triggers when the motor gets too hot. There is no reset for this condition. When the motor cools, the thermal switch resets automatically. In some cases, a faulty circuit can also cause this problem.

Diagnostic Tools: Clamp-on ammeter, voltmeter.

Suggested Spare Parts (Page 61): Circuit board, pump.

Standard Troubleshooting Approach

Press JETS Button. Does motor make a "laboring" sound?

No → Is voltage from circuit board to pump correct after pump quits? Check for 240 VAC at recommended test points. See table at right for a listing of recommended test points.

No → Is the pump icon lit on the control panel display?

No → This means the control system has turned the pump off. Verify system operation as follows:

1. Verify control panel buttons and are working properly.
2. Try unplugging the remote panel and testing the sytem.
3. If the control panel and remote panel tests ok, change the circuit board.

Yes → Replace circuit board.

Yes → Pump has thermally shut down. Refer to section 9.12 (page 47)

Yes → Is there sufficient voltage connected to hot tub. Check for 240 VAC –10% at TB1 test points 18 and 19.

No → Call an electrician to fix problem.

Yes → Check voltage with pump running. Is the voltage 240 VAC –10% at test points 18 and 19.

No → This is caused by insufficient wiring or the pump motor drawing too much current. Contact Jacuzzi Premium Technical Support.

Yes → Replace pump.

Recommended Test Points:

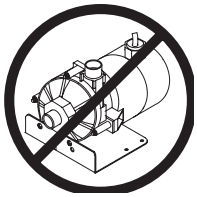
1. Low Speed Pump 1 - test points 1 & 3
2. High Speed Pump 1 - test points 1 & 5
3. Pump 2 - test points 8 & 10
4. Pump 2, J-380 - test points 8 & 19
5. Pump 3, J-380 - test points 6 & 10

Circuit Board Illustrations:

A. 2002+ Protech LCD, Pages 55 and 56

Danger: Electrical Shock Hazard Exists!
High Voltage Present On Circuit Board. Use Extreme Caution While Servicing Circuit Board.

9.11 Circulation Pump Not Working

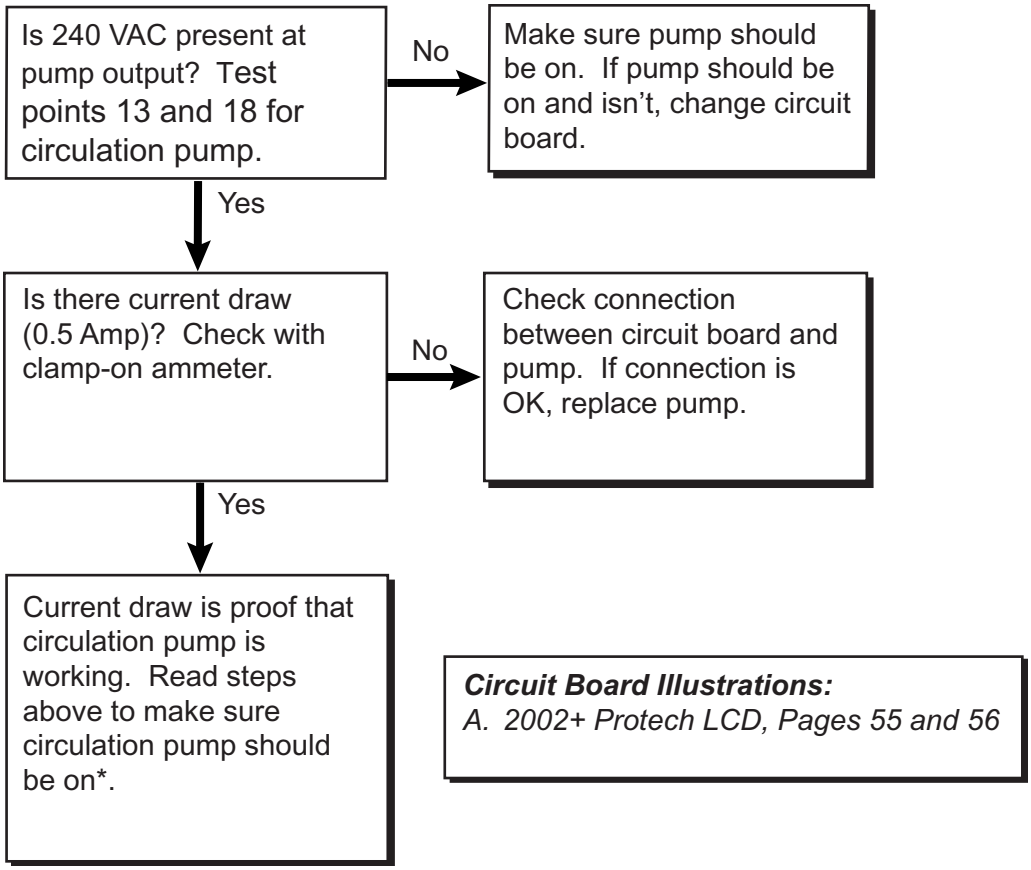


The circulation pump should be on for the programmed duration each day and for a heat call unless “Summer Logic” is activated. Verify the pump should be on before trouble-shooting. Check the circulation pump start time and duration setting. *Refer to section 5.6C (page 24).*

Diagnostic Tools: Clamp-on ammeter, voltmeter.

Suggested Spare Parts (Page 61): Circuit board, circulation pump.

Standard Troubleshooting Approach


Is 240 VAC present at pump output? Test points 13 and 18 for circulation pump.
No
Make sure pump should be on. If pump should be on and isn't, change circuit board.
Yes
Is there current draw (0.5 Amp)? Check with clamp-on ammeter.
No
Check connection between circuit board and pump. If connection is OK, replace pump.
Yes
Current draw is proof that circulation pump is working. Read steps above to make sure circulation pump should be on*.

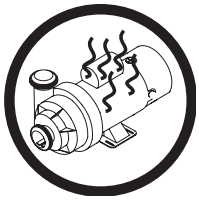
Circuit Board Illustrations:
A. 2002+ Protech LCD, Pages 55 and 56

**Note: If the circulation pump is running, but there is no water flow, check for an air lock, a blockage in the plumbing, debris in the pump or a broken pump impeller.*

If power to the hot tub has been interrupted, the circulation pump cycle will stop and restart only after the programmed start time passes in 24 hours. During this time, the circulation pump will only run if there is a heat call or during the 2 hour automatic blowout cycle that runs each night from 12:00am to 2:00am.

Danger: Electrical Shock Hazard Exists!
High Voltage Present On Circuit Board. Use Extreme Caution While Servicing Circuit Board.

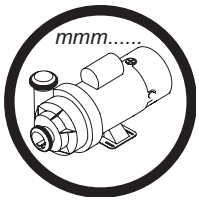
9.12 Troubleshooting A Thermal Pump Cutout



1. Verify that the voltage to the hot tub is 240 VAC ±10%. An insufficient voltage supply can cause the motor to pull too much current and to overheat.
2. Check the voltage to the hot tub. Remember, the power company is required by law to provide the correct voltage to the customer. They will come out and check suspected problems (in most cases, free of charge). Use the "Control Panel Displays With Service Jumper Installed" feature (section 5.5, page 23) to read the hot tub's memory trouble log to verify how low the line voltage has been since the hot tub was installed or since the last time it was service reset.
3. If the voltage is OK, examine the environment in which the hot tub is installed. Hot sun, hot weather, and the lack of a breeze can cause heat buildup in the equipment bay in addition to the normal heat produced by the pump. This can raise the temperature high enough to cause the thermal cutout to trip. Use the "Control Panel Displays With Service Jumper Installed" feature (section 5.5, page 23) to read the hot tub's memory trouble log to verify how hot the load box got since the hot tub was installed or since the last time the system was service reset (Revision 9.50A Eproms only). There are two possible solutions to thermal cutout problems which are not due to low line voltage. One is to change the filter cycle periods so that they do not coincide with the hottest time of the day and peak power consumption hours. Another is to ventilate the equipment bay. Call Jacuzzi Premium Technical Support for advice on this matter.
4. If there seems to be no overheating problem, yet the motor keeps cutting out, the motor's thermal switch may be bad. In this case the pump should be replaced.

Note: There is a thermistor on the circuit board which monitors ambient temperature inside the load box. A memory chip on the circuit board also records the highest, lowest and present temperature inside the load box for service reference. When the temperature reaches 180ºF (82ºC), the topside control panel will display "HOT" (see "HOT" description on page 21). While the temperature in the load box is not exactly the temperature in the rest of the equipment bay, it certainly is an indication of that temperature. ***This feature is only available on the 9.50A Revision Eproms. It has been discontinued for 2003 on the 9.50B Revision Eproms.***

9.13 Pump Hums And Will Not Start



If the pump impeller is not "frozen", this condition almost always indicates a bad start capacitor. This component is inside the motor housing.

Diagnostic Tools: Voltmeter.

Suggested Spare Parts (Page 61): Pump and motor, circuit board.

Standard Troubleshooting Approach

1. Press the Jets 1 button.
2. Check voltage at pump 1 (low speed) test points 1 and 3 for 240 VAC. If there is no voltage, replace the circuit board. If voltage is present, the pump needs to be repaired or replaced.

If pump 1 runs in low speed but hums in high speed, make sure the circuit board is not sending voltage to both speeds at the same time. When voltage exists while in low speed at test points 1 and 3, there should be no voltage at test points 1 and 5. Conversely, when voltage exists while in high speed at test points 1 and 5, there should be no voltage at test points 1 and 3. If voltage is present across both sets of test points at the same time, replace the circuit board. Refer to pages 55 and 56 for the circuit board layout.

Recommended Test Points (Pages 55 and 56):

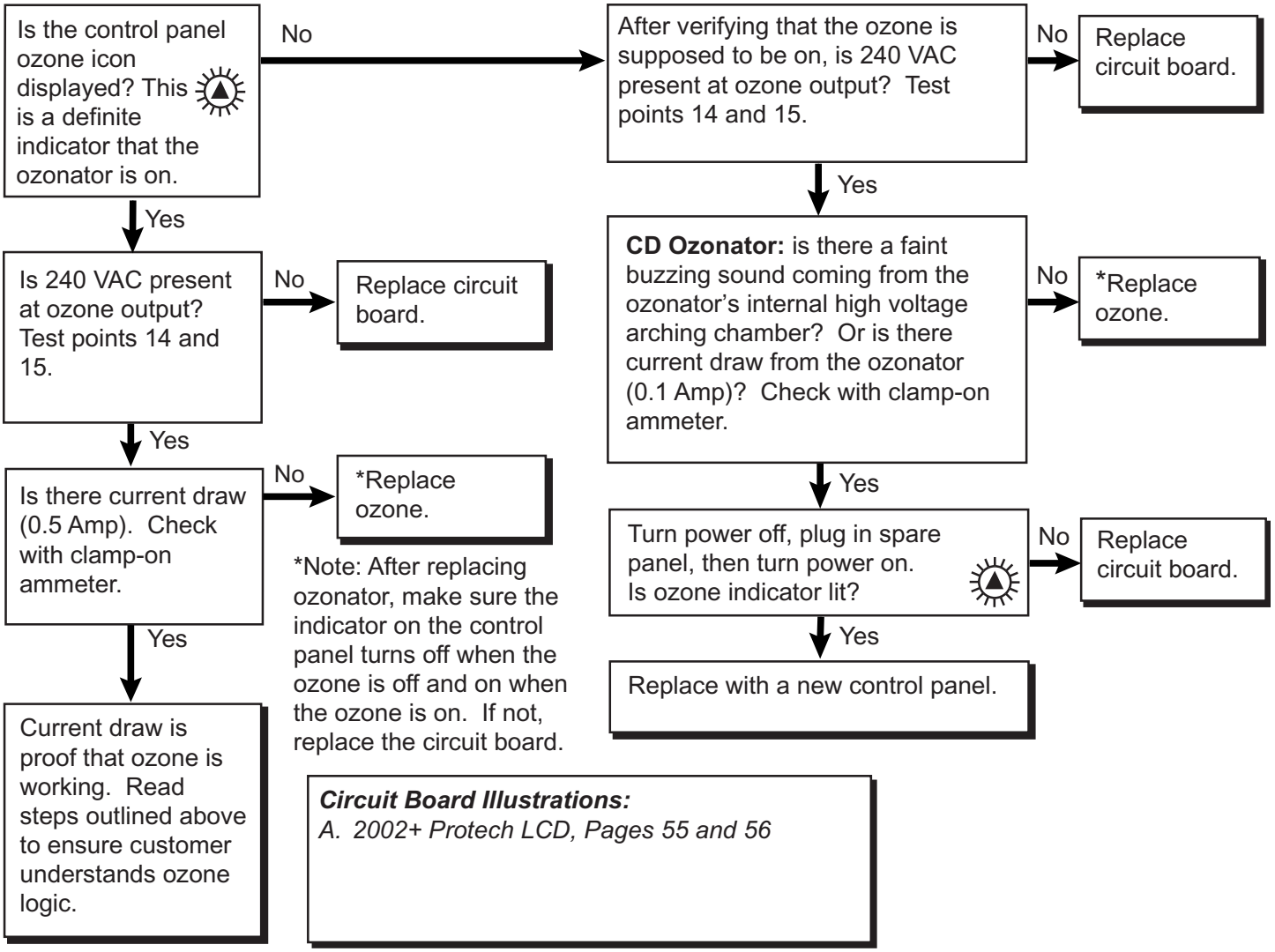
- Pump 1 - Low speed test points 1 and 3; high speed test points 1 and 5.
- Pump 2 - high speed test points 8 and 10 *(J-380 - test points 8 and 19).*
- *Pump 3 - J-380 only, high speed test points 6 and 10.*

9.14 Ozone not working

Diagnostic Tools: Clamp-on ammeter and voltmeter.

Suggested Spare Parts (Page 61): Ozonator, circuit board, control panel.

Standard Troubleshooting Approach


Is the control panel ozone icon displayed? This is a definite indicator that the ozonator is on.
No
After verifying that the ozone is supposed to be on, is 240 VAC present at ozone output? Test points 14 and 15.
No
Replace circuit board.
Yes
Is 240 VAC present at ozone output? Test points 14 and 15.
No
Replace circuit board.
Yes
CD Ozonator: is there a faint buzzing sound coming from the ozonator's internal high voltage arching chamber? Or is there current draw from the ozonator (0.1 Amp)? Check with clamp-on ammeter.
No
*Replace ozone.
Yes
Is there current draw (0.5 Amp). Check with clamp-on ammeter.
No
*Replace ozone.
Yes
Turn power off, plug in spare panel, then turn power on. Is ozone indicator lit?
No
Replace circuit board.
Yes
Current draw is proof that ozone is working. Read steps outlined above to ensure customer understands ozone logic.
*Note: After replacing ozonator, make sure the indicator on the control panel turns off when the ozone is off and on when the ozone is on. If not, replace the circuit board.
Replace with a new control panel.

Circuit Board Illustrations:
A. 2002+ Protech LCD, Pages 55 and 56

Danger: Electrical Shock Hazard Exists!
High Voltage Present On Circuit Board. Use Extreme Caution While Servicing Circuit Board.

Appendix

A1.0 Checking Voltage To The Hot Tub

Correct supply voltage wiring to the hot tub is essential for safe/proper operation. The first step in troubleshooting a new installation should be to take voltage readings at the main terminal block. ***Do not trust wire colors. Electricians make mistakes and electrons are colorblind.***

A low line voltage or incorrectly wired hot tub will result in either of the following symptoms:
A) Strange or intermittent symptoms, B) Displays with indications that simply cannot be correct.

Many of the most perplexing problems in the past have been wiring errors and voltage drop problems. Human safety depends on proper hot tub grounding. It is essential that the line voltage readings described below are as indicated. The ground connection must be heavy duty wiring. Multiple grounds are advisable whenever possible. All models are exclusively powered 240 VAC and require three wires for operation (fig. 25).

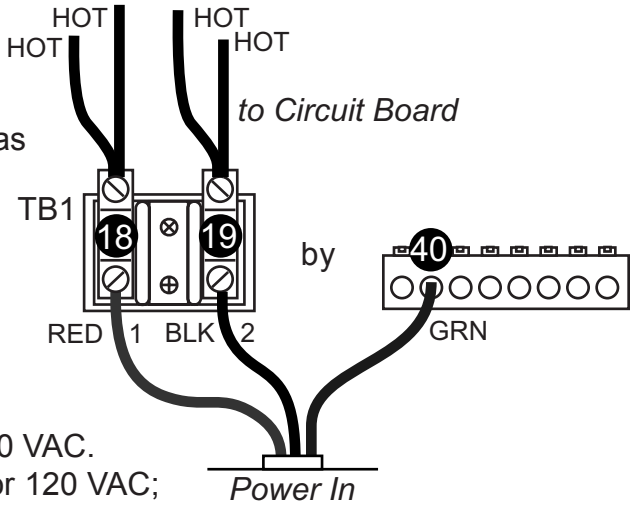


fig. 25

Verify Proper Hot Tub Wiring As Follows:

- Hot to Hot: measure across test points 18 and 19 for 240 VAC.
- Hot to Ground: measure across test points 18 and 40 for 120 VAC; then across test points 19 and 40 for 120 VAC.

Refer to pages 55 and 56 for the circuit board illustrations.

240 VAC 3-Wire Power Connections

Danger: Electrical Shock Hazard Exists!
High Voltage Present On Circuit Board. Use Extreme Caution While Servicing Circuit Board.

A2.0 Checking Voltage To Components

Refer to pages 55 and 56 for the circuit board's test point locations. Voltages going to components are often measured at the circuit board to determine whether the circuit board or the component is bad. If the circuit board delivers voltage when the component operation is called, the circuit board is probably good and the problem lies with the component or the wiring to the component.

This voltage chart shows operating voltages for all major hot tub components. Voltage is considered good if within ±10% of the listed value.

Component	Test Points	Voltage ±10%
Pump 1 Low Speed	1 and 3	240 VAC
Pump 1 High Speed	1 and 5	240 VAC
Pump 2 High Speed	8 and 10	240 VAC
Pump 2 J-380 High Speed	8 and 19	240 VAC
Pump 3 J-380 High Speed	6 and 10	240 VAC
Circulation Pump	13 and 18	240 VAC
5.5kW Tube Heater	2 and 4	240 VAC
Ozone Generator	14 and 15	240 VAC

A3.0 Checking Current Consumption Of Components

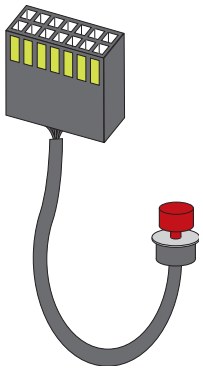
This table lists current draw for most major hot tub components.

Component Current Ratings

Model	Pump 1 Low Speed	Pump 1 High Speed	Pump 2	Pump 3 (J-380)
J-380	2.8A	8.5A	9.8A	10.0A
J-370	2.8A	8.5A	9.8A	N/A
J-360	2.8A	8.5A	9.8A	N/A
J-350	2.8A	8.5A	9.8A	N/A

Model	Circulation Pump	Heater	Ozone Generator	Transformer
J-380	0.5A	22.9A	0.5A	0.5A
J-370	0.5A	22.9A	0.5A	0.5A
J-360	0.5A	22.9A	0.5A	0.5A
J-350	0.5A	22.9A	0.5A	0.5A

fig. 26



A4.0 The Test Plug

The test plug (fig. 26) is a device which does the following:

1. Substitutes fixed resistors for the temperature sensor and hi-limit / freeze sensor.
2. Substitutes a momentary contact switch (like a doorbell switch) for the hot tub's flow switch.
3. Bypasses the door interlock switch circuit by jumpering it's circuit board connections.
4. Refer to sections A4.1 - A4.3 below for additional information.

A4.1 When To Use The Test Plug

When any of the following error messages (fig. 27) flash on the control panel LCD:

- Sn1
- Sn3
- ICE
- OH
- FLO
- Watchdog (----)
- If either temperature sensor or hi-limit sensor are suspected to be inaccurate.

fig. 27

A4.2 How To Use The Test Plug

1. Turn off the hot tub power for personal safety and to prevent "confusing" the electron-
2. ics.
   Remove the sensor harness plug from position J6 in the circuit board and install the test plug in it's
3. place. With the test plug installed, the temperature will read 73ºF (23ºC).
   If the control panel displayed any message other than FLO, turn the hot tub power on and verify if the error goes away. If the error goes away, refer to section A4.3. If the error remains, verify the

Warning:
Remove The Test Plug Immediately After Performing This Test!

A4.3 Interpreting The Results

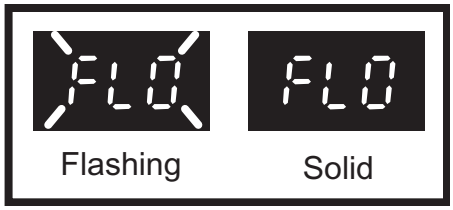
• **Sn3 -** Message goes away when the test plug is installed and the hot tub is powered up. Replace the temperature sensor.

• **Sn1, ICE, OH -** Message goes away when the test plug is installed and the hot tub is powered up. Replace the hi-limit freeze sensor.

• **FLO -** Message does not appear when the test plug is used as described in "Testing The Flow Switch" (section A5 below). Replace the flow switch.

If the error message continues after installing the test plug, verify the condition of your test plug, then replace the circuit board. If the actual water temperature and control panel readings are different and installing the test plug produces a 73ºF (23ºC) reading, the circuit board is OK. Test the temperature and/or the hi-limit sensor. Refer to the resistance chart A12 on page 58.

A5.0 Testing The Flow Switch



When either a flashing or a solid "FLO" message appears, it means the flow switch contacts have failed to close when the circulation pump is on, or failed to open when the circulation pump is off. This could be caused by an obstruction in the flow path, a misaligned flow switch or a defective flow switch. The first thing to look for is an obvious obstruction in the flow switch fitting, remembering (while not likely) that is possible for a small object to work its way into the plumbing where it will not be obvious. After verifying no obvious blockage exists, the flow switch can be tested as follows:

Test Procedure:

1. Turn off the hot tub's power to prevent "confusing" the electronics. Remove the sensor harness connector J6 on the circuit board and install the test plug connector in its place.
2. Turn on the hot tub's power. Verify that the circulation pump is pumping water, then press and hold the test plug switch. The "FLO" message should not display. If it does, replace the circuit board. If the "FLO" message does not display, observe the water flow from the heater return line. Does the water flow look normal? If not, check for a clogged filter cartridge or plumbing blockage.
3. Press the Jets 1 button to activate pump 1 in low speed. Observe the jets. Does the water flow look normal? If not, check the plumbing for a blockage. If the water flow looks normal in both the circulation pump and the therapy jets, the flow switch is probably bad, misaligned or there is a bad connection between the flow switch and the circuit board. Verify that the connections between the flow switch and the circuit board are good; then verify that the flow switch directional arrow is pointing in the direction of flow towards the return fitting outlet. If the switch orientation is incorrect, loosen or tighten the switch no more than 1/2 turn to establish proper alignment. The switch's flow arrow must be parallel to tee fitting as shown (fig. 28, page 53). Test the system operation. If the condition corrects, skip steps 4-5.
4. Visually inspect the flow switch for debris interference or damage. If debris is present, remove the debris, then reinstall the flow switch with the arrow pointing towards the return fitting outlet. Test the system. If the switch is damaged, replace the switch and retest the system. If the condition corrects, skip step 5.
5. Remove the flow switch connector pins from the sensor harness connector (fig. 29, page 53). Test the switch operation with an ohmmeter (set to 1000-2000 Ω range) for continuity across the switch terminals. Measure resistance across the switch terminals for infinite resistance with the magnet arm not touching the switch body (fig. 30, page 53), and for continuity (0 Ω) with the magnet arm touching the magnet body (fig. 30, page 53). If the flow switch tests OK, check the switch wiring harness. If the harness tests OK, replace the circuit board.

fig. 28

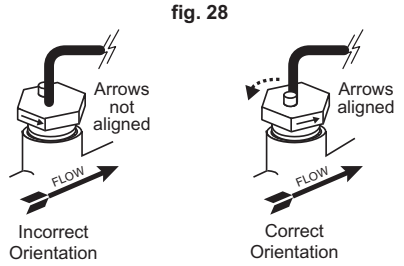
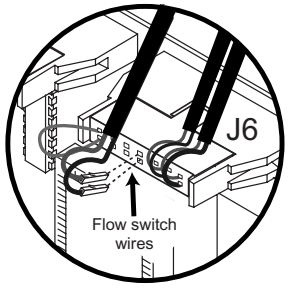
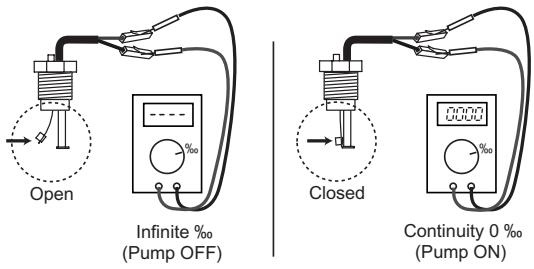


fig. 29



Remove flow switch wires from sensor harness connector J6. Refer to section A15 (page 60) for proper wire removal/ installation techniques.

fig. 30



A6.0 About Fuses

When current passes through a conductor the conductor heats up. If the conductor is a heavy piece of wire or a strip of metal, it will pass large currents and generate very little heat. If a wire is fine, or a strip of metal is thin, it will heat up at lower current levels. Fuses rely on this principle to protect circuits from massive current flows by simply melting if their current rating is exceeded. By selecting different alloys for the fuse element, fuses can be made to have their current rating exceeded for a short period of time. Such slow-blow fuses are excellent for protecting motor circuits where start up currents (surge currents) are higher than running currents

Fuse	Part Number	Protects Against Excessive Current Draw From:
Main Power (30A)	6660-105	Main Pumps or Circulation Pump
Transformer Primary (1.25A)	6660-112	Transformer
Transformer Secondary (4A)	6660-119	Circuit Board or Multi-Colored Light
Stereo (10A)	2000-081	Optional Spa Stereo
Pump 2, J-380 (20)	6000-520	Pump 2 on J-380 Models

Testing Fuses

A good fuse should read zero ohms (continuity) when removed from the spa; a blown fuse will read infinite ohms (no continuity).

Caution: Make sure replacement fuses are exactly those listed above. Never test a fuse for continuity while installed in the fuse holder. Always check for exposed wires that can cause shorts and blow the fuse. Rats and mice like to chew wires!

A7.0 The Watchdog (----)
Four horizontal dashes (----) with nothing else illuminated (not even the LCD backlight) is a result of the watchdog circuitry detecting a potential destructive condition within the hot tub.

Before making the service call, ask the customer to turn power off and then back on. If this corrects the problem, have the customer monitor the hot tub and call the next time it occurs.

There are many conditions that can cause a watchdog error message. Except for a runaway heat condition, most are caused by a faulty circuit board, bad hi-limit or temperature sensor. On rare occasions a control panel or a bad transformer will cause Watchdog. Confirm this by using a test panel and testing the transformer connections on the circuit board. *Refer to the circuit board illustrations on pages 55 and 56.*

1. Turn off power to the hot tub.
2. Install the service jumper (JP9 #1). *Refer to section 7.1 (page 28).*
3. Unplug sensor harness and install the test plug. *Refer to section A4.2 (page 51).*
4. Turn on power to the hot tub. If the heater is not overly hot to the touch and the Watchdog posts an immediate dashed line error, the circuit board is probably bad. Check the control panel, transformer connections, and the second mini-fuse F(1) before changing the circuit board. *Refer to the circuit board illustrations on pages 55 and 56.*
5. If there is not a Watchdog indication, see what the Trouble Log *(section 5.5, page 23)* tells you regarding possible high voltage. Also check the hi-limit reading to see if the temperature in the heater has reached 118ºF (48ºC). If the heater got too hot, check for flow restrictions or malfunctioning circulation pump and correct the problem.
6. The hot tub turning on after installing the test plug indicates a possible problem with the hi-limit sensor or temperature sensor. Check the resistance value of each component with the chart on page 54. Replace the sensor that doesn't match the chart.
7. If you cannot produce the Watchdog error, the sensors check out OK, and the trouble log gives you no indication of what went wrong, reset the Trouble Log to present *(see section 1.8, page 10)* and tell the customer to call you if the Watchdog happens again.

Note: A poor connection between the T1 transformer secondary connector J4 and the circuit board may cause and intermittent Watchdog error.

A8.0 Understanding Ozone
Oxygen is an element, and like other elements, normally exists as a pair of atoms bonded together to make a whole molecule. Chemists therefore use the symbol O_2 to speak of "oxygen molecules" rather than oxygen atoms.

In the presence of an electric discharge like lightning or a strong source of ultraviolet light, three molecules of O_2 combine to form two molecules of O_3 known as ozone. While oxygen has no smell, ozone has a very pronounced smell in large concentrations. In small quantities, it causes the pleasant "fresh air" smell that laundry has when dried on an outdoor clothesline. Some clothing dryer manufacturers have installed an ultraviolet lamp inside their machines to give clothes that "fresh-as-all-outdoors" smell. Jacuzzi Premium uses a high quality Corona Discharge to generate ozone which is introduced into the hot tub water.

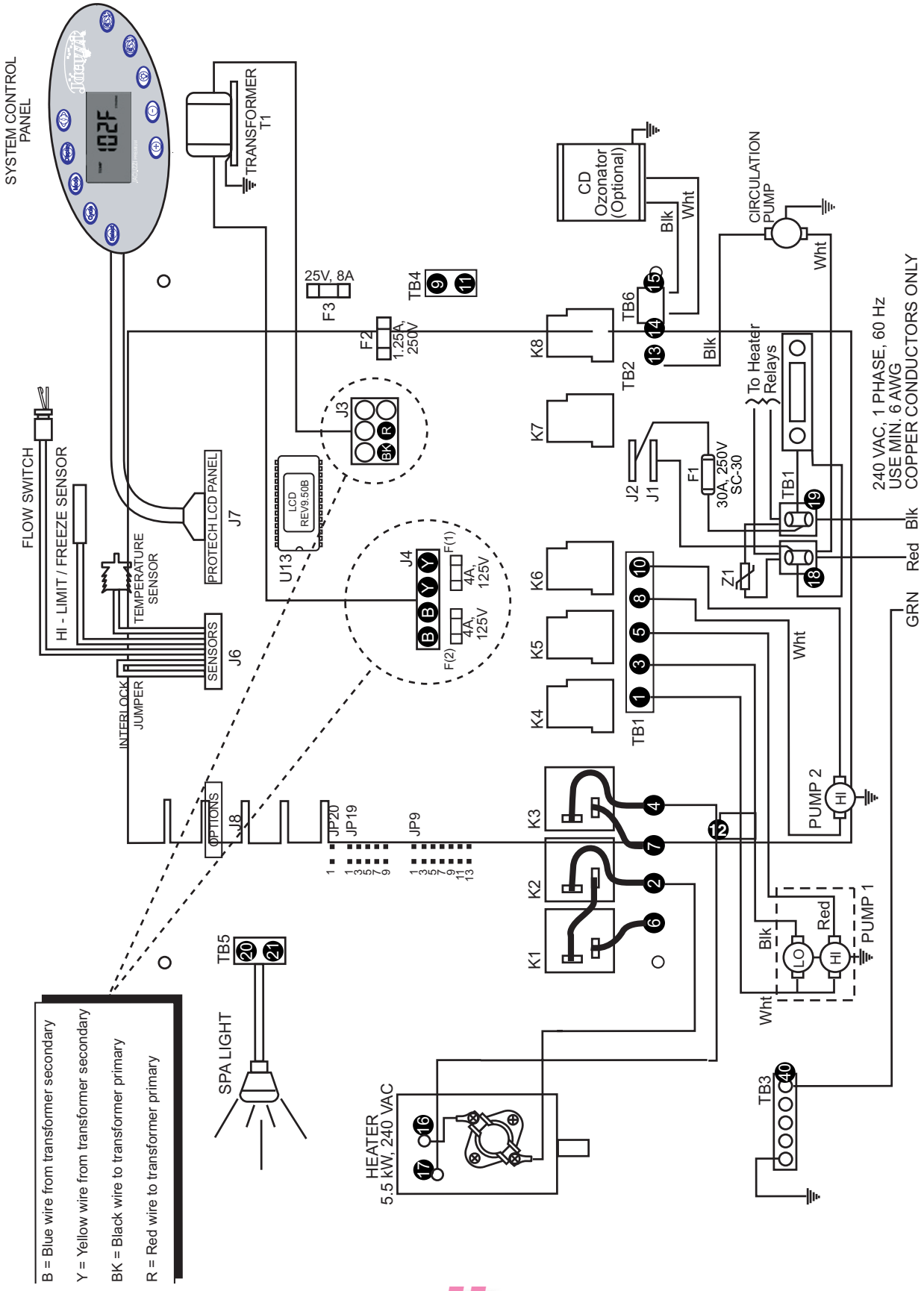
The technician must understand three things about ozone:
1. Ozone (O_3) breaks down quickly into plain oxygen (O_2).
2. Ozone kills germs.
3. Ozone is a strong oxidizer.

Because ozone breaks down quickly into oxygen (O_2), the hot tub would have to run 24 hours a day with the ozone generator operating to insure constant disinfecting. Even then a residual sanitizer must be used. There are two choices, chlorine or bromine. While chlorine is oxidized by ozone just as quickly as bromine, the resulting bromine compounds are a much better disinfectant than the resulting chlorine compounds. Therefore, ozone and bromine team up much better to do the overall job than ozone and chlorine.

A9.0 2002+ ProTech LCD Circuit Board Illustration (240 VAC / 3-Wire Connection)

All 2002+ US/Canada 60Hz Models

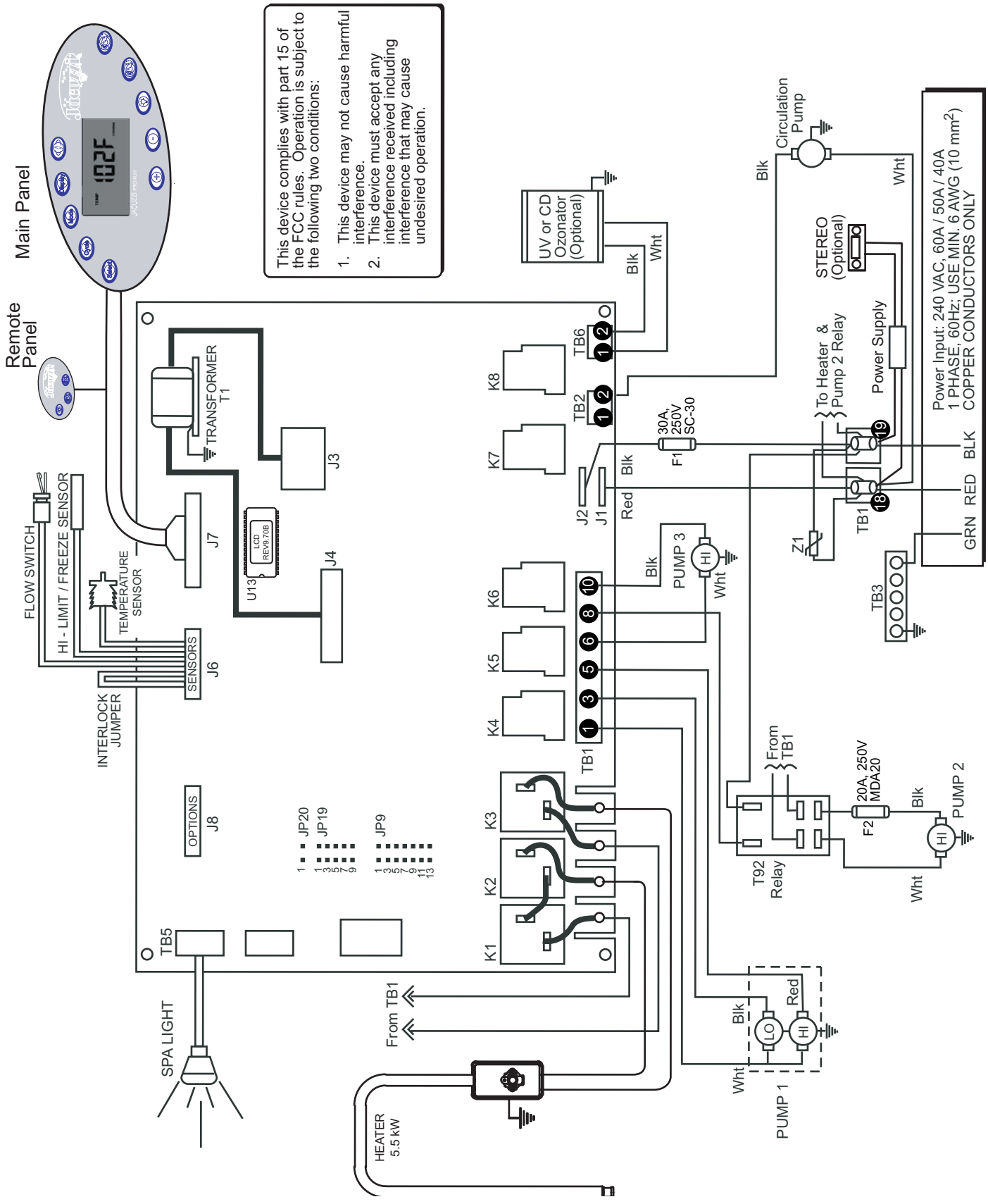
- Board Type: ProTech LCD, 2 Pump, #6600-092.
- Campatible Models: 2002+ J-370, J-360, J-350.



A10.0 2002+ J-380 ProTech LCD Circuit Board Illustration (240 VAC / 3-Wire Connection)

All 2002+ US/Canada 60Hz Models

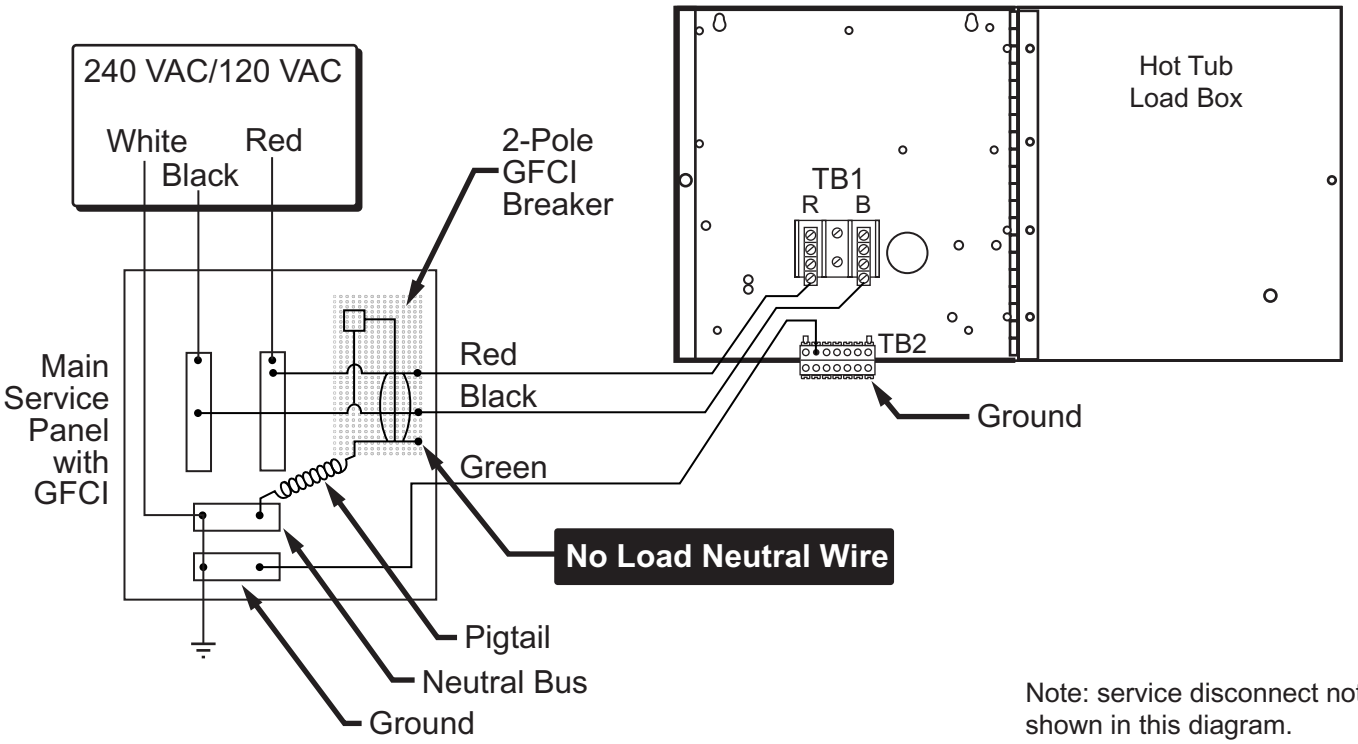
- Board Type: ProTech LCD, 3 Pump, #6600-101.
- Campatible Models: 2002+ J-380.



A11.0 Load Box Connection Diagrams A-B

A

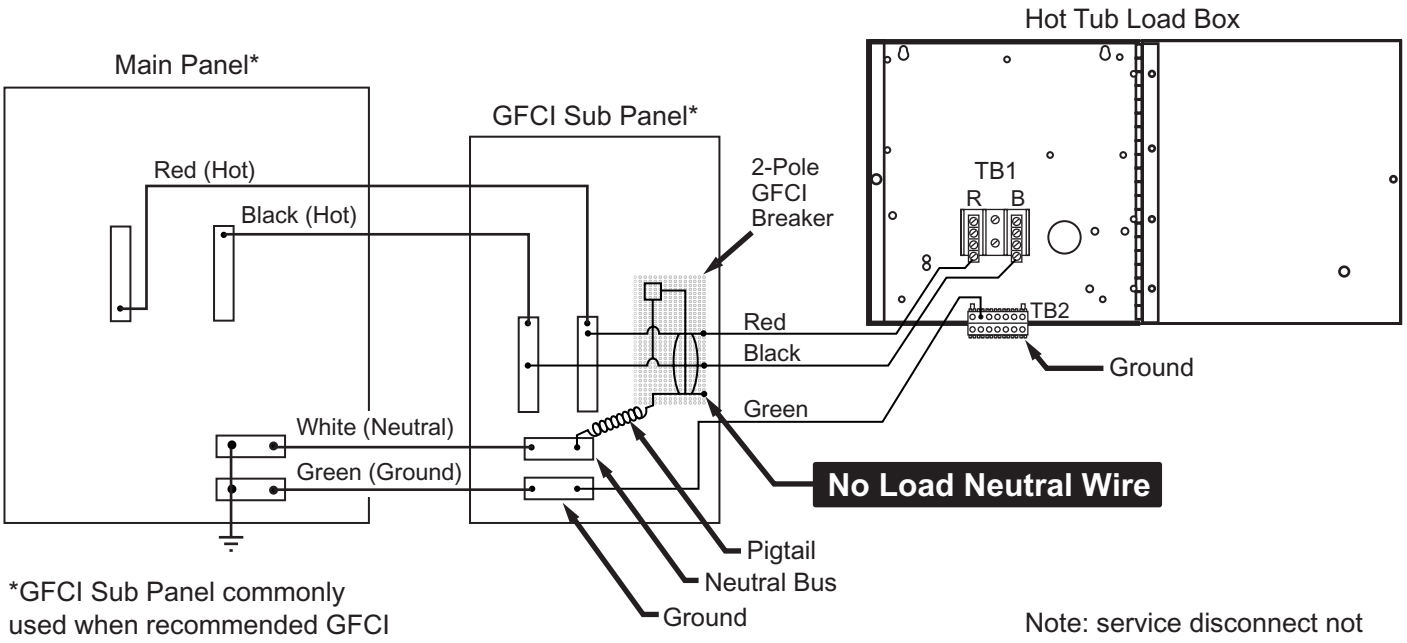
2-Pole Circuit Breaker with 2-Wire Grounded Load Connection
(3 Wires to Hot Tub, 2-Hot, 1-Ground)



Note: service disconnect not shown in this diagram.

B

Main Panel with Secondary GFCI Sub-Panel Using a
2-Pole GFCI Breaker with 2-Wire Grounded Connection
(3 Wires to Hot Tub, 2-Hot, 1-Ground)



*GFCI Sub Panel commonly used when recommended GFCI does not install in Main Panel.

Note: service disconnect not shown in this diagram.

A12.0 Temperature / Hi-Limit Sensor Resistance Chart

Fahrenheit (ºF)	Celcius (ºC)	Ohms (Ω)
59.0	15	48840
60.8	16	46680
62.6	17	44610
64.4	18	42630
66.2	19	40770
68.0	20	39000
69.8	21	37290
71.6	22	35700
73.4	23	34170
75.2	24	32700
77.0	25	30000
78.8	26	28740
80.6	27	27540
82.4	28	26400
84.2	29	25311
86.0	30	24270
87.8	31	23280
89.0	32	22329
91.4	33	21429
93.2	34	20571
95.0	35	19740
96.8	36	18960
98.6	37	18210
100.4	38	17490
102.2	39	16800
104.0	40	16149
105.8	41	15519
107.6	42	14919
109.4	43	14349
111.2	44	13800
113.0	45	13281

A13.0 Transformer Test

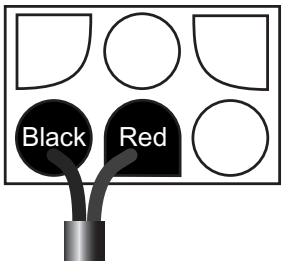
To Test The Transformer:

1. Leave the transformer primary J3 and the secondary J4 connectors plugged into the circuit board.
2. Set your voltmeter to the highest VAC range.
3. Place voltmeter probes into the backside (wire side) of the J3 or J4 connector and test as follows:

Main Power Transformer Primary/Secondary Voltages

Connector J3	Voltage
Black to Red	240 VAC

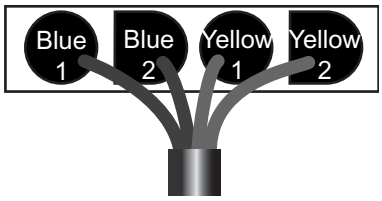
Transformer Primary
(Wire End View)



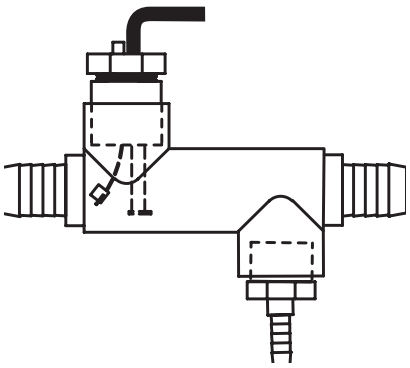
Connector J4	Voltage
Blue 1 to Blue 2	8 to 10 VAC
Yellow 1 to Yellow 2	12 to 14 VAC
Blue 1 to Yellow 1	<15 VAC
Blue 1 to Yellow 2	<15 VAC
Blue 2 to Yellow 1	<15 VAC
Blue 2 to Yellow 2	<15 VAC

Ø Voltage at these test points is acceptable.

Transformer Secondary
(Wire End View)

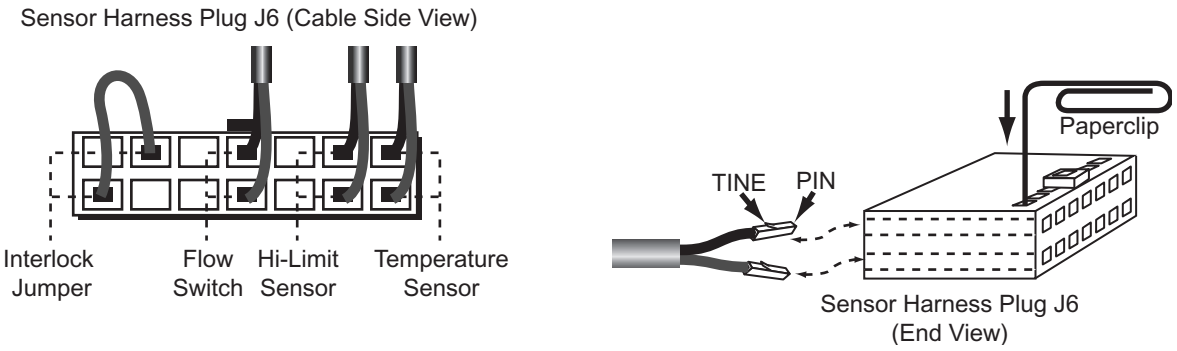


A14.0 Flow Switch Illustration



The flow switch has a clear housing for visual inspection. It also has a potted cable that cannot be removed. To electronically test the flow switch, the cable pins located in the sensor harness connector J6 must be removed. *Refer to section A15 (page 60) for cable pin removal instructions.*

A15.0 Sensor Harness Connector Diagram



To remove a sensor or flow switch wire from the sensor harness connector J6, insert the end of a paper clip or similar device into the slot corresponding with the wire to be removed. This will depress the pin tine, allowing the wire to be pulled from the harness connector.

Important! When reinstalling the sensor or switch wire back into the sensor harness connector, make sure the pin tine is lifted (approximately 1/32") prior to inserting the wire. This will ensure the sensor wire locks into the harness connector. Do not over bend the pin tine or it may break off!

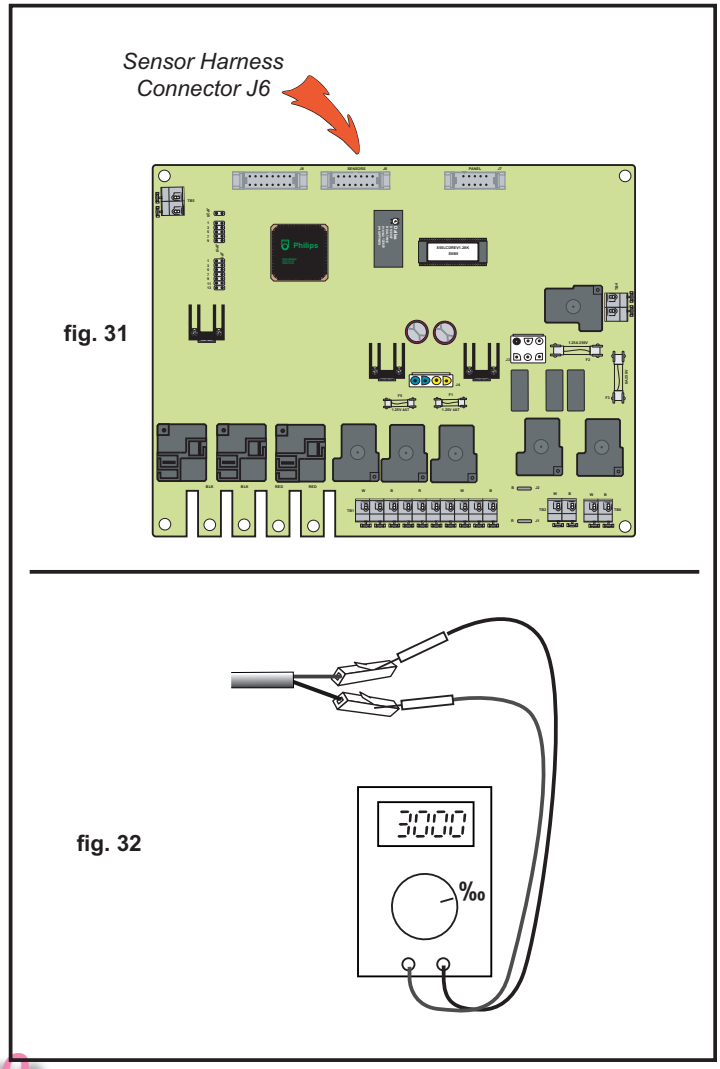
A16.0 Testing The Hi-Limit and Temperature Sensors

Both the hi-limit and temperature sensors can be tested using an ohmmeter.

Test Procedure:

1. In order to test each sensor you must first remove its wires from the sensor harness connector J6 (fig. 31). *Refer to section A15 above for proper wire removal/installation instructions.*
2. Set you ohmmeter to the 100-200k (Ω) range.
3. Place the ohmmeter test leads across the exposed sensor pins as shown (fig. 32). Compare the measured sensor resistance against the chart in section A12 (page 58). Replace the sensor if the measured resistance value does not match the published value,

Note: For the most accurate resistance reading, do not hold the sensor pins in your hands wire testing. Your hands could add to the resistance value, giving an inaccurate reading.



A17.0 Suggested Spare Parts
(ProTech LCD)

Circuit Boards
- 6600-092: J-370, J-360, J-350
- *6600-093: Export J-370, J-360, J-350*
- 6600-101: J-380 Only
- *6600-102: Export J-380 Only*

Control Panels
- 2600-303: Main Control Panel, All Models
- 2600-304: Remote Control Panel, 50/60Hz
- *2600-305: All Export, Main Control Panel*

Filter Cartridges
- 6540-476: 60 sq. ft., All Models

Flow Switch
- 6560-860: All Models

Fuses
- 6660-105: 30A, Main Power, All Models
- 6660-112: 1.25A, Transformer Primary
- 6760-119: 4A, Transformer Secondary
- 6000-520: 20A, Pump 2, J-380 Only
- 2000-081: 10A, Stereo
- *6660-106: 20A, Export, Main Power, All Models*

Heater Assembly
- 6500-403: 5.5kW Tube Heater
- *6500-401: Export, 2.7kW Tube Heater*

Hi-Limit Sensor
- 6600-110: Box End Connectors, All Models

Mazzei Kit
- 6472-486: Includes Hose Clamps, All Models

Multi-Colored Light Kits
- 6560-420: Underwater Light, All Models
- 6560-422: Waterfall Light, All Models Mfg. After 4/29/02
- 6000-339: Waterfall Light, All Models Mfg. From 1/1/02 to 4/15/02

Owner's Manual
- 6530-224: All Domestic and Export Models

Ozone Generator
- 6472-685: 240 VAC, 60Hz, All Models
- *6472-685E: Export, 230 VAC, 50Hz, All Models*

Main Jet Pumps
- 6500-254: Pump #1, J-360
- 6500-261: Pump #1, J-380, J-370, J-350
- 6500-263: Pump #2, J-350
- 6500-307: Pump #2, J-380, J-370, J-360
- 6500-269: Pump #3, J-380
- *6500-299: Pump #1, All Export Models*
- *6500-124: Pump #2, Export, J-380 - J-360*
- *6500-239: Pump #2, Export, J-350*
- *6500-294: Pump #3, Export, J-380*

Circulation Pump
- 6500-035: All Models
- *6500-023: Export, All Models*

Temperature Sensor
- 6600-105: Box End Connectors, All Models

Transformer
- 6560-274: 240 VAC, All Models
- *6660-039: Export, 230 VAC, All Models*

Note: You must reuse the old plugs when ever replacing any transformer. A new replacement transformer will not come in with any plugs.

A18.0 Glossary Of Terms

Circuit Board: Printed circuit board assembly that distributes voltage to selected components.

Control Panel: Component that allows user to access functions provided by the circuit board.

Ammeter: Device which measures electrical current conducted through a wire or electrical device.

Eprom: Chip on the circuit board that stores hot tub software.

Flow Switch: Switch that informs circuit board there is sufficient water movement to activate heater. This switch identifies water flow.

Hi-Limit Sensor: Sensor that monitors water temperature inside heater.

Jumper: Device on circuit board that mechanically connects (bridges) two points together.

Ohmmeter: Device that measures the resistance in ohms (Ω) of a component or temperature sensitive device (e.g. temperature sensor, heater element, etc.).

Ozonator: A device that produces ozone gas by passing air by a UV light source or through Corona Discharge (high voltage arc) methods.

ProClear: A 24-hour ozone filtration system added to a hot tub's circulation pump line which introduces Ozone while circulating the water.

Pin Assignments: Locations identified by numbers on circuit board.

Sensor Harness: Plug in connector containing the temperature sensor, hi-limit sensor, flow switch and interlock jumper device connections.

Summer Logic: Deactivates circulation pump and ozone when hot tub water reaches 2ºF (1ºC) above the set temperature. Hot tub water must be 95ºF (35ºC) or higher for summer logic to activate.

Temp. Sensor: Sensor that monitors hot tub water temperature.

Test Plug: Testing device that simulates a working sensor harness.

Transformer: Device that converts primary high voltage AC signal to a secondary low voltage AC signal.

Trouble Log: An automatic updating memory log built into the control system.

Voltage Meter: Device that measures AC or DC voltage potentials across components or from a specific test point to ground.

Troubleshooting Data Collection Form
Protech LCD Models

Customer Name _____

Address _____ Phone ( ) _____

Before troubleshooting, collect the following:

1. Model # of Hot Tub _____
2. Serial Number _____
3. Operating Voltage _____ Input Voltage _____

Before calling Jacuzzi Premium, collect the following:

4. Low Speed Pump 1 Amps _____
5. Circ Pump with Heater Amps _____
6. High Speed Pump 1 Amps _____
7. Pump 2 Amps _____
8. Pump 2 and Pump 3 Amps (J380) _____
9. High Speed Pump 1, Pump 2, and Heater Amps _____
10. Circuit Board Eprom Revision _____

Trouble Log Readings

11. Voltage % Highest _____ Present _____ Lowest _____
12. Hi-Limit Highest _____ Present _____ Lowest _____
13. Temp.Sensor Highest _____ Present _____ Lowest _____

(9.50B Eprom Only)

Reset each value to present. Press button while each value is displayed.

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PREMIUM

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